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Non-Conventional Armament Linkages:  
Nuclear, Biological and Chemical Weapons in  
the United Kingdom and Iraq

Robert D. Lovsin  
Doctor of Philosophy  
Science & Technology Policy

University of Sussex  
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I hereby declare that this dissertation has not been, and will not be, submitted to this or any other university for the award of any other degree.

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## ABSTRACT

This dissertation examines the reasons why states want to acquire non-conventional weapons and analyzes interconnections between decisions on nuclear weapons (NW) on the one hand and chemical/biological weapons (CBW) on the other. Much of the literature on non-conventional weapons has tended to focus either on nuclear weapons or on CBW, with CBW often portrayed as the “poor man’s nuclear bomb.” While there is some truth in this, the interconnections between decisions to develop NW and decisions to develop CBW are more numerous, more varied and more nuanced.

The dissertation examines non-conventional armament processes in the United Kingdom and Iraq. Using two disparate cases provides the analysis with a comprehensive data set, the lessons from which have formed the basis of the analysis. Having nuclear, biological and chemical (NBC) weapons for the purpose of use is not always a state’s ultimate goal and factors as wide-ranging as national prestige and the maintenance of international relationships are important in determining why some states decide to pursue NBC weapons. The case study findings have been synthesized into four key areas in which NBC linkages are particularly significant: strategic issues and strategic cultures; political considerations; economics and finances; and future challenges.

The key finding is that there *are* interconnections that show how NW and CBW influence each other. For example, both the UK and Iraq showed that if nuclear weapons were not available, interest in CBW would increase. Conversely, possession of nuclear weapons does not necessarily rule out interest in acquiring CBW armament.

Non-conventional weapons present a significant challenge to the maintenance of international peace and security. As this dissertation demonstrates, NBC weapons are linked on many levels and it is important to understand how CBW can and do influence policy on nuclear weapons and vice versa.



## ACKNOWLEDGEMENTS

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**LIST OF ABBREVIATIONS**

ABM – Anti-Ballistic Missile Defence  
ADW – Agent Defeat Warhead  
AEA – Atomic Energy Act (US)  
ASR – Air Staff Requirement  
AST – Air Staff Target  
ATB – Atmospheric Test Ban Treaty  
ATCC – American Type Culture Collection  
AWRE – Atomic Weapons Research Establishment, Aldermaston  
BBC – Bromobenzyl Cyanide  
BHER – Basic High Explosive Research  
BRAB – Biological Research Advisory Board  
BW – Biological Weapons  
BWC – Biological Weapons Convention  
CBW – Chemical and Biological Weapons  
CDE – Chemical Defence Establishment  
CDES – Chemical Defence Experimental Station, Porton Down  
CIA – Central Intelligence Agency  
CDRE – Chemical Defence Research Establishment, Sutton Oak  
CoS – Chief of Staff  
CW – Chemical Weapons  
CWC – Chemical Weapons Convention  
DPC – Defence Policy Committee  
DRPC – Defence Research Policy Committee  
DPRK – Democratic People’s Republic of Korea (North Korea)  
DSTL – Defence Science and Technology Laboratory, Porton Down  
DSM – Laboratory for the Development of Substitute Materials (Manhattan Project)  
EDC – Engineering Design Centre  
EDD – Engineering Design Directorate  
EMIS – Electromagnetic Isotope Separation  
EPW – Earth Penetrating Weapon  
FFCD – Full, Final and Complete Disclosure (Iraq)

HDBT – Hardened and Deeply Buried Target  
HER – High Explosive Research  
HEU – Highly Enriched Uranium  
IAEA – International Atomic Energy Commission  
IAEC – Iraqi Atomic Energy Commission  
ICC – Iraqi Chemical Corps  
ICI – Imperial Chemical Industries  
IED – Improvised Explosive Device  
IR – International Relations  
ISG – Iraq Survey Group  
ISSBW – Inter-Services Subcommittee on Biological Warfare (UK)  
kt – Kiloton of TNT  
kWth – Kilowatt Thermal  
LIS – Laser Isotope Separation  
MED – Manhattan Engineer District  
MIC – Military Industrial Commission  
MIMI – Ministry of Industry and Military Industrialization  
MoD – Ministry of Defence  
MoS – Ministry of Supply  
MRC – Medical Research Council (UK)  
MRLA – Malayan Races Liberation Army  
MSE – Muthanna State Establishment  
MTR – (nuclear) Materials Testing Reactor  
Mt – Megaton of TNT  
MWth – Megawatt Thermal  
NATO – North Atlantic Treaty Organization  
NBC – Nuclear, Biological and Chemical  
NCRC – National Council of the Revolutionary Command  
NDRC – National Defence Research Committee  
NPT – Nuclear Nonproliferation Treaty  
OKW – Oberkommando der Wehrmacht (German High Command of the Army)  
OMV – On-going Monitoring and Verification  
OPCW – Organization for the Prohibition of Chemical Weapons  
OPEC – Organization of Petroleum Exporting Countries

OSRD – Office of Scientific Research and Development (US)  
PC-3 – Petrochemical 3 (name of Iraq’s nuclear weapons programme)  
PUK – Patriotic Union of Kurdistan  
RAF – Royal Air Force  
RCC – Revolutionary Command Council  
SOE – Special Operations Executive  
SALT – Strategic Arms Limitation Talks/Treaty  
SHIB – Sussex Harvard Information Bank  
STRD – Scientific and Technical Research Directorate  
TNA – The National Archives  
TRC – Technical Research Centre  
UNSCR – United Nations Security Council Resolution  
UK – United Kingdom  
UKAEA – United Kingdom Atomic Energy Authority  
UNSCOM – United Nations Special Commission  
UN – United Nations  
UNMOVIC – United Nations Monitoring, Verification and Inspection Commission  
US – United States  
USAEC – United States Atomic Energy  
USC – United States Code  
USSR – Union of Soviet Socialist Republics (former Soviet Union)  
WMD – Weapon(s) of Mass Destruction

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## INTRODUCTION

The chief foundations on which all states rest,  
whether they are new, old, or mixed, are good laws and good arms...  
there cannot be good laws where there are not good arms,  
and where there are good arms there are bound to be good laws.<sup>1</sup>

- Niccolò Machiavelli, *The Prince*

Throughout history significant technological advances have occurred in the areas of weapons and armament, combat tactics and strategic doctrine. As Martin van Creveld explains:

War is completely permeated by technology and governed by it. The causes that lead to wars, and the goals for which they are fought; the blows with which campaigns open, and the victories with which they (sometimes) end; the relationship between the armed forces and the societies that they serve; planning, preparation, execution, and evaluation; operations and intelligence and organization and supply; objectives and methods and capabilities and missions; command and leadership and strategy and tactics; even the very conceptual frameworks employed by our brains in order to think about war and its conduct – not one of these is immune to the impact that technology has had and does have and always will have.<sup>2</sup>

The twentieth century ushered in a new era of modern military technology and improved war fighting capabilities. The First World War saw the introduction of aircraft combat tactics, armoured tanks and the submachine gun.<sup>3</sup> Also during this time, advances in the chemical industry made the large-scale production of chemical warfare agents possible. L. F. Haber states, “the industrial-scale technology for making the gases and the means for delivering them did not exist until the very end of the nineteenth century.”<sup>4</sup> The use of poison gas during the First World War was widespread with Germany at the leading edge of research and production of new and different types of chemical warfare agents, leaving Britain, France and Russia the difficult job of playing catch up.

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<sup>1</sup> Niccolò Machiavelli, *The Prince*, translated and edited by Robert M. Adams (New York: W. W. Norton, 1992), 34.

<sup>2</sup> Martin van Creveld, *Technology and War: From 2000 BC to the Present* (New York: Free Press, 1989), 1.

<sup>3</sup> Tim Travers, *How the War Was Won: Factors that Led to Victory in World War One* (Barnsley: Pen & Sword Military Classics, 2005), 35-36.

<sup>4</sup> L. F. Haber, *The Poisonous Cloud: Chemical Warfare in the First World War* (Oxford: Clarendon Press, 1986), 15.

State interest in non-conventional weapons grew steadily throughout the interwar period, up to and including the Second World War when it became apparent that it would be scientifically possible to harness the power of the atom.<sup>5</sup> Concerned that Germany may be attempting to unravel the mysteries of nuclear fission British interest in acquiring this technology increased. By the end of the Second World War research into nuclear, biological and chemical (NBC) weapons had become standard practice for a handful of states. In the aftermath of the bloodiest war in history, interest in the military application of science and technology was on the rise. History has shown that many states have been interested in acquiring these types of weapons for a multitude of reasons, which will be addressed in due course.

Certain types of nuclear, biological and chemical weapons, as Falkenrath, Newman and Thayer explain, “often share three appalling characteristics; immense lethality, insofar as a single weapon can kill thousands of people; portability, which allows the weapons to be delivered against civilian populations and unprepared military forces; and accessibility, which means that they could fall into unfriendly hands, despite the best efforts at prevention.”<sup>6</sup> Some of these weapons have been researched, developed or deployed during the twentieth century by a number of states including the United States (US), United Kingdom (UK), and the former Soviet Union (USSR).<sup>7</sup> Other states have tried and failed to acquire this technology despite their best efforts, some have considered programmes and some have voluntarily dismantled their military programmes.<sup>8</sup> What continues to be of concern is the value that certain states still place on non-conventional weapons technology. Through a thorough understanding of past

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<sup>5</sup> It was understood, at least for a while, that atomic energy could *theoretically* be used for military applications. This all changed with the Frisch-Peierls Memorandum on the Properties of a Radioactive “Super-bomb,” TNA AB 1/210.

<sup>6</sup> Richard A. Falkenrath, Robert D. Newman and Bradley A. Thayer, *America’s Achilles’ Heel: Nuclear, Biological, and Chemical Terrorism and Covert Attack* (Cambridge: MIT Press, 1998), 1.

<sup>7</sup> See Table 1.

<sup>8</sup> Sweden, Switzerland and South Africa are three states that gave up their respective quests for nuclear weapons for varying domestic or international concerns. For Sweden see Paul M. Cole, “Atomic Bombast: Nuclear Weapon Decision-Making in Sweden, 1946-72,” *Washington Quarterly*, Volume 20, Number 2, (1997): 233-251; Jan Prawitz, “From Nuclear Option to Non-Nuclear Promotion: The Sweden Case,” *Swedish Institute of International Affairs, Research Report 20*, 1995. The history of the Swiss nuclear weapons programme is patchy and mostly in German, though some sources have been translated into English. See Jürg Stüssi-Lauterburg, “Historical Outline on the Question of Swiss Nuclear Armament,” Government of Switzerland Report, Federal Administration, Bern, April 1966, accessed 11 May 2011, <http://nuclearweaponarchive.org/Library/Swissdoc.html>. For South Africa see, Helen E. Purkitt and Stephen F. Burgess, *South Africa’s Weapons of Mass Destruction* (Bloomington: Indiana University Press, 2005); Ronald W. Walters, *South Africa and the Bomb: Responsibility and Deterrence* (Lexington: Lexington Books, 1987).

state programmes it is hoped that the reasons will become apparent and measures can be taken to prevent state-level acquisition of NBC weapons.

### *Research Questions*

During the Cold War the majority of research on potential uses of NBC weapons was concentrated principally on the threat of nuclear confrontation between the US and USSR and their respective allies. The lack of study dealing with interconnections between NBC weapons has been compounded by the paucity of academic analyses that have historically centered on nuclear weapons development, chemical/biological weapons (CBW) development or an examination of weapons of mass destruction (WMD). I believe that an analysis of the interconnections between nuclear weapons (NW) and CBW is long overdue and necessary as the state-level acquisition of an NBC weapons capability presents the single most serious long-term security threat facing the advanced democracies of the West and their interests.

While the literature on nuclear weapons is rich and plentiful, chemical and biological weapons have not been written about as extensively. Several authors have examined the subject from a development or proliferation perspective<sup>9</sup> but the connections between NW on the one hand and CBW on the other and how they have influenced each other has been previously unexplored. This dissertation will endeavour to achieve this by utilizing a multiple case study format based on states that have either developed NBC weapons programmes or have attempted to. The idea is that by analyzing the conditions in the UK (1946-57) and Iraq (1980-95), one can see how these decisions were made in disparate cases.

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<sup>9</sup> Brian Balmer, *Britain and Biological Warfare: Expert Advice and Science Policy, 1930-65* (Basingstoke: Palgrave, 2001); Frank Barnaby, *How Nuclear Weapons Spread* (New York: Routledge, 1993); Margaret Gowing, *Britain and Atomic Energy: 1939-1945* (London: Macmillan, 1964); Margaret Gowing and Lorna Arnold, *Independence and Deterrence: Britain and Atomic Energy, 1945-1952. Volume I, Policy Making* (London: Macmillan, 1974); Margaret Gowing and Lorna Arnold, *Independence and Deterrence: Britain and Atomic Energy, 1945-1952, Volume II, Policy Execution* (London: Macmillan, 1974); Jeanne Guillemin, *Biological Weapons: From the Invention of State-Sponsored Programs to Contemporary Terrorism* (New York: Columbia University Press, 2005); L. F. Haber, *The Poisonous Cloud: Chemical Warfare in the First World War* (Oxford University Press: 1986); Richard G. Hewlett and Oscar E. Anderson, *The New World: 1939-1946* (University Park: Pennsylvania State University Press, 1962); Tom Mangold and Jeff Goldberg, *Plague Wars: The Terrifying Reality of Biological Warfare* (New York: St Martin's Press, 1999); Richard Rhodes, *Dark Sun: The Making of the Hydrogen Bomb* (New York: Simon and Schuster, 1995); John Simpson, *The Independent Nuclear State: The United States, Britain and the Military Atom* (London: Macmillan, 1983); Jonathan B. Tucker, *War of Nerves: Chemical Warfare From World War I to Al-Qaeda* (New York: Pantheon, 2006); Stockholm International Peace Research Institute (SIPRI), *The Problem of Chemical and Biological Warfare Volumes I to VI* (Stockholm: Almqvist & Wiksell, 1971-1975).

The central question that will be the focus of my dissertation is, why do states decide to acquire NBC weapons, and how have decisions to develop nuclear weapons and decisions to develop chemical and biological weapons, influenced each other? This type of question raises a number of smaller questions specifically related to its wording. What exactly is meant when referring to a nuclear, biological or chemical weapon? Why is there a need for a distinction between nuclear and chemical and biological? Why are chemical and biological weapons categorized together? These are important considerations and will be addressed in the appropriate sections.

The primary research question is important as a considerable lack of awareness on chemical and biological warfare issues still exists. More specifically, how might ignorance of CBW armament dynamics affect decisions states will take regarding the development and acquisition of nuclear weapons including decisions against acquisition? Also, could the lack of impetus for CBW create a new set of problems related to the control of these types of weapons? With the entry into force of the Chemical Weapons Convention (CWC) and the 1997 inauguration of the Organisation for the Prohibition of Chemical Weapons (OPCW), security and proliferation concerns over chemical weapons have become much less significant.<sup>10</sup> The belief is that with the creation of the CWC and the Biological Weapons Convention (BWC), which are disarmament treaties, these two types of weapons have been satisfactorily dealt with and the elements that are in place to help deal with control and governance aspects of CBW are effective. This, sadly, is not the case as chemical and biological weapons still present a host of security and proliferation concerns.<sup>11</sup>

The difference with the nuclear weapons threat is that the Nuclear Non-Proliferation Treaty (NPT) is a treaty designed to limit the proliferation of nuclear weapons to non-nuclear weapon states and allowing for the retention of nuclear weapons for the five recognized nuclear weapon states. Therefore it is of extreme

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<sup>10</sup> J. P. Perry Robinson, "Scientists and Chemical Weapons Policies," in *Assessing the Threat of Weapons of Mass Destruction: The Role of Independent Scientists*, ed. John L. Finney and Ivo Šlaus. (Amsterdam: IOS Press, 2010), 79-89; Donald A. Mahley, "The OPCW: Reflecting on the Model," *The CBW Conventions Bulletin*, Issue 83/84 (July 2009): 1-4; Jonathan B. Tucker, *War of Nerves: Chemical Warfare From World War I to Al-Qaeda* (New York: Pantheon, 2006), 375-386; Oliver Thraenert and Jonathan B. Tucker, "Freeing the World of Chemical Weapons: The Chemical Weapons Convention at the Ten-Year Mark," *SWP Research Paper no.8* (Berlin: Stiftung Wissenschaft und Politik, July 2007), 33.

<sup>11</sup> See Jonathan B. Tucker, "Verifying the Chemical Weapons Ban: Missing Elements," *Arms Control Today*, January/February 2007, accessed 11 May 2011, [http://www.armscontrol.org/act/2007\\_01-02/Tucker](http://www.armscontrol.org/act/2007_01-02/Tucker).

importance that awareness of CBW issues is not marginalized and relegated to the sidelines of international arms control negotiations.

Each case of a state trying to acquire a nuclear, biological or chemical weapons capability is unique and must be treated as such. According to Joseph Cirincione:

The decision to pursue or not pursue nuclear weapons is not as simple and clean cut as it might first appear. No single model can explain all of the different decisions made by distinct leaders in disparate states, each of which faces its own unique security threats, possesses its own national identity; and must contend with its own domestic political pressures.<sup>12</sup>

This can be extended to include biological and chemical weapons as well. There is an array of reasons as to why these weapons are desirable and no single explanation can adequately provide an all-encompassing answer.<sup>13</sup> As Scott Sagan explains, “Nuclear weapons, like other weapons, are more than tools of national security; they are political objects of considerable importance in domestic debates and internal bureaucratic struggles and can also serve as international normative symbols of modernity and identity.”<sup>14</sup> For the UK the key policy decisions that led the British government to develop NBC weapons were different and were made in a contrasting fashion to Iraq. British decisions were pragmatic in nature and often made in response to perceived military threat, though other factors did exert some influence over the decisions taken. National prestige, domestic politics and the regional threats posed by Iran and Israel were the driving forces behind Iraq’s decision, under Saddam Hussein, to arm with non-conventional weapons.

Using the UK and Iraq as case studies will enable this research project to better understand the *how* as well as the *why* aspect of the primary research question. These cases are different and in using them I will endeavour to illustrate the myriad reasons why states attempt to acquire NBC weapons and to demonstrate the interconnections between NW and CBW. Using the United Kingdom and Iraq as a basis, I will synthesize and further elaborate upon these interconnections using additional historical data, gathered during my research, in a concluding chapter. Prior to that, it is necessary to outline some key terms, concepts and definitions related to nuclear, biological and chemical weapons.

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<sup>12</sup> Joseph Cirincione, *Bomb Scare: The History and Future of Nuclear Weapons* (New York: Columbia University Press, 2007), 82.

<sup>13</sup> Chapter Five will provide an in-depth analysis of this phenomenon.

<sup>14</sup> Scott D. Sagan, “Why Do States Build Nuclear Weapons? Three Models in Search of a Bomb,” *International Security*, Volume 21, Number 3 (Winter 1996-97): 55.

### *NBC Weapons – Definitions and Terms*

It is important when entering into an analysis of nuclear, biological and chemical weapons that certain terms, concepts and definitions are clearly illustrated and their meanings understood. According to the United States Code<sup>15</sup> (USC):

The term “atomic weapon” means any device utilizing atomic energy, exclusive of the means for transporting or propelling the device (where such means is a separable and divisible part of the device), the principal purpose of which is for use as, or for development of, a weapon, a weapon prototype, or a weapon test device.<sup>16</sup>

There are four traditional categories of nuclear weapons, pure fission, boosted, enhanced radiation and fusion.<sup>17</sup> Pure fission weapons use fission-only reactions as a source of energy. Fission bombs operate by rapidly assembling a subcritical configuration of fissile material into one that is highly supercritical.<sup>18</sup> The original atomic bombs designed, tested and deployed by the US in 1945 were pure fission weapons, albeit different bomb designs.

A boosted weapon is essentially a fission weapon with a few grams of a deuterium and tritium gas mixture included in the fissile core.<sup>19</sup> As the fission chain reaction begins, the deuterium and tritium gas mixture undergoes fusion, which results in the release of an intense burst of high-energy neutrons that causes another intense burst of fissions in the core.<sup>20</sup> These weapons are very efficient, with a typical yield several times higher than ordinary fission weapons, which enables designers to reduce its overall size and weight.<sup>21</sup> An enhanced radiation weapon, commonly referred to as a

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<sup>15</sup> The United States Code is “a consolidation and codification by subject matter of the general and permanent laws of the United States.” It is prepared and published by the Office of the Law Revision Counsel of the US House of Representatives. “Office of the Law Revision Counsel.” US House of Representatives, accessed 27 April 2011, <http://uscode.house.gov/>.

<sup>16</sup> Atomic and nuclear are used interchangeably, but for the purpose of this dissertation nuclear will be the preferred taxonomy. “Title 42 – The Public Health and Welfare, Chapter 23 – Development and Control of Atomic Energy, Division A – Atomic Energy, Subchapter I – General Provisions, Section 2014 (d) – Definitions,” United States Code, accessed 7 September 2009, <http://frwebgate6.access.gpo.gov/cgi-bin/TEXTgate.cgi?WAISdocID=435866265979+17+1+0&WAISection=retrieve>.

<sup>17</sup> “Nuclear Weapon Design.” Federation of American Scientists, accessed 8 September 2009, <http://www.fas.org/nuke/intro/nuke/design.htm>.

<sup>18</sup> Carey Sublette, “Nuclear Weapons Frequently Asked Questions - Section 1.0 Types of Nuclear Weapons, Version 2.16: 1 May 1998.” Nuclear Weapon Archive, accessed 8 September 2009, <http://nuclearweaponarchive.org/Nwfaq/Nfaq1.html>.

<sup>19</sup> Lorna Arnold describes two different ways of boosting fission weapons – core boosting and tamper boosting. See Lorna Arnold, *Britain and the H-Bomb* (Basingstoke: Palgrave, 2001), 86-87.

<sup>20</sup> “Types of Nuclear Weapons – Fission Weapons.” CTBTO Preparatory Commission, accessed 5 June 2010, <http://www.ctbto.org/nuclear-testing/types-of-nuclear-weapons/page-4/?textonly=1>.

<sup>21</sup> David Albright and Theodore B. Taylor, “A Little Tritium Goes a Long Way,” *Bulletin of the Atomic Scientists*, Volume 44, Number 1 (January/February 1988): 39.

neutron bomb, has an output in which neutrons and X-rays are made to constitute a substantial portion of the total energy released.<sup>22</sup>

The most powerful type of weapon is a fusion or thermonuclear weapon. The Teller-Ulam design, or the classical 'Super' was, according to Lorna Arnold:

a tank or pipe full of liquid deuterium (deuterium is a gas at normal temperatures) with an atomic bomb on one end. This bomb would be a large, powerful uranium gun (not an implosion device) with an unheard-of yield, several hundred kilotons. Some tritium would have to be added to the deuterium at the atom bomb end of the pipe since, it was generally agreed, a propagating reaction in deuterium alone would be impossible at the temperatures achievable. A flood of neutrons from the atomic bomb explosion would initiate the thermonuclear reactions. The whole assembly might yield 40 megatons but the yield was theoretically unlimited.<sup>23</sup>

As Arnold explains, since there is no critical mass for the fusion process, extremely large yields are possible. On 30 October 1961 the USSR tested *Tsar Bomba* over Novaya Zemlya in the Arctic Sea. Codenamed *Ivan* by its Soviet developers, it had a yield of 50 megatons (Mt), making it the largest device ever tested.<sup>24</sup>

Chemical weapons (CW) use toxic chemicals to cause death, temporary incapacitation or permanent harm to humans and animals through chemical action on life processes. In the sense of the 1993 Chemical Weapons Convention, "chemical weapons" means the following, together or separately:

- (a) Toxic chemicals and their precursors, except where intended for purposes not prohibited under this Convention, as long as the types and quantities are consistent with such purposes;
- (b) Munitions and devices, specifically designed to cause death or other harm through the toxic properties of those toxic chemicals specified in subparagraph (a), which would be released as a result of the employment of such munitions and devices;
- (c) Any equipment specifically designed for use directly in connection with the employment of munitions and devices specified in subparagraph (b).<sup>25</sup>

There are a number of different classifications of chemical weapons, including lung irritants, vesicants, blood gases and nerve agents. The First World War saw the initial

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<sup>22</sup> "Nuclear Weapon Design." Federation of American Scientists, accessed 8 September 2009, <http://www.fas.org/nuke/intro/nuke/design.htm>.

<sup>23</sup> Arnold, *Britain and the H-Bomb*, 13.

<sup>24</sup> Gerard DeGroot, *The Bomb: A History of Hell on Earth* (London: Pimlico, 2005), 253-255.

<sup>25</sup> "Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction (Chemical Weapons Convention), Article II, Definitions and Criteria." Organization for the Prohibition of Chemical Weapons, accessed 10 September 2009, <http://www.opcw.org/chemical-weapons-convention/articles/article-ii-definitions-and-criteria/>.

large-scale use of toxic chemicals as weapons. A brief history of chemical weapons and chemical warfare will be addressed in Chapter Three.

Biological weapons<sup>26</sup> (BW) affect life and life processes through the infectivity or toxicity of microbial or other pathogens. For effectiveness, the pathogens may need special processing in order to “weaponize” them. This procedure is the transformation of pathogens to a state of inherent stabilization, which is necessary in order for the agents to be able to withstand the introduction of an alien environment, such as the trip from the laboratory to the production facility or a flight into the earth’s stratosphere.

Article I of the Biological Weapons Convention states that:

Each State Party to this Convention undertakes never in any circumstances to develop, produce, stockpile or otherwise acquire or retain:

- (1) Microbial or other biological agents, or toxins whatever their origin or method of production, of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes;
- (2) Weapons, equipment or means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict.<sup>27</sup>

Chemical and biological weapons are frequently referred to in a similar context and grouped together in one category, CBW, even though these two types of weapons have different characteristics and different potential as weapons. Compared with biological weapons, many chemical weapons have a tactical battlefield application and are effective over a localized area. The Iraqi army successfully used chemical weapons as a force multiplier in its eight-year war with neighbouring Iran in order to counter the massed human wave attacks the Iranians were launching through Iraq’s southern marshes.<sup>28</sup> The delayed effects of certain biological weapons and their vulnerability to weather make them inapt to tactical military objectives.<sup>29</sup> Biological agents can impede the mobilization of opposing forces as well as be an effective tool for creating fear and panic in a civilian population.<sup>30</sup> Catherine Jefferson believes that chemical and

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<sup>26</sup> There are some differences as to what constitutes a biological agent and a biological weapon. Without getting into too much detail regarding the weaponization process as it is beyond the scope of this project, the term biological weapons will be used, while taking into consideration the technical differences between the terms.

<sup>27</sup> “Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction.” The Biological and Toxin Weapons Convention Website, accessed 27 July 2010, <http://www.opbw.org/>.

<sup>28</sup> See Chapter 4, pages 124-130.

<sup>29</sup> This does not include toxins, some of which are fast acting in their effects.

<sup>30</sup> Richard Danzig and Pamela B. Berkowsky, “Why Should We Be Concerned About Biological Warfare?” in *Biological Weapons: Limiting the Threat*, ed. Joshua Lederberg. (Cambridge: MIT Press, 2001), 10.



biological weapons should be seen as part of a spectrum rather than as distinct categories. She argues that, "Though certain characteristics of BW (such as incubation period and contagiousness) may distinguish it from CW, sharp technical distinctions become more problematic when considering grey areas such as toxins (chemicals derived from organisms)."<sup>31</sup> Julian Robinson believes that it is important to recognize what features CW and BW have in common and what security risks they pose.<sup>32</sup> The category of CW and the category of BW both include types of weapons that have the capacity to create mass-casualties, instill fear and terror in a civilian population, disrupt an opposing force's mobilization and logistical efforts and they work by affecting basic life processes.<sup>33</sup> As Robinson explains:

The mechanisms of toxicity and infectivity that characterize CBW are the mechanisms through which we can, if we are so minded, exploit for weapons purposes that most impressive feature of today's science -- its accelerating understanding of the processes of life. As we comprehend more and more of how life works at the molecular level, so too may we be able to learn to *manipulate* life at the molecular level.<sup>34</sup>

Although the terms NBC weapons and WMD are often used interchangeably, for the purpose of this dissertation the term NBC is preferred as opposed to the blanket term WMD.<sup>35</sup> Though the term WMD has been around for over seventy years<sup>36</sup> it has reached the apex of popularity over the past few decades. One of the problems with the term WMD has to be the many different interpretations as to what constitutes WMD. In *Defining Weapons of Mass Destruction*, Seth Carus highlights over forty different definitions of WMD, many of which are used by various institutions within the US government and other international organizations.<sup>37</sup> While a universally agreed upon definition of WMD does not exist, there are many examples that attempt to define this

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<sup>31</sup> Catherine Jefferson, "The Chemical and Biological Weapons Taboo: Nature, Norms and International Law" (DPhil diss., University of Sussex, 2009), 12-13.

<sup>32</sup> Julian Robinson, "Bringing the CBW Conventions Closer Together," *The CBW Conventions Bulletin*, Issue 80 (September 2008): 1.

<sup>33</sup> Chemical and biological weapons might also be developed for purposes of incapacitation. For further information on this issue see *Incapacitating Biochemical Weapons: Promise or Peril?* ed. Alan M. Pearson, Marie Isabelle Chevrier and Mark Wheelis. (Lanham: Lexington Books, 2007).

<sup>34</sup> Robinson, "Bringing the CBW Conventions Closer Together," 1.

<sup>35</sup> "NATO's Response to Proliferation of Weapons of Mass Destruction: Facts and Way Ahead. Press Release (95) 124, 29 November 1995." North Atlantic Treaty Organization (NATO), accessed 9 September 2009, <http://www.nato.int/docu/pr/1995/p95-124.htm>.

<sup>36</sup> The first use of the term "weapons of mass destruction" is thought to be by Cosmo Gordon Lang, Archbishop of Canterbury, in 1937 in reference to the aerial bombardment of Guernica, Spain. "Archbishop's Appeal," *Times*, 28 December 1937, 9.

<sup>37</sup> W. Seth Carus, "Defining 'Weapons of Mass Destruction'," *Occasional Paper no.4*, Center for the Study of Weapons of Mass Destruction, National Defense University, Washington, DC, January 2006.

particular concept. The August 1948 United Nations Commission for Conventional Armaments states that:

Weapons of mass destruction should be defined to include atomic explosive weapons, radio active material weapons, lethal chemical and biological weapons, and any weapons developed in the future which have characteristics comparable in destructive effect to those of the atomic bomb or other weapons mentioned above.<sup>38</sup>

The definition of WMD currently used by the US military is:

Weapons that are capable of a high order of destruction and/or of being used in such a manner as to destroy large numbers of people. Weapons of mass destruction can be high explosives or nuclear, biological, chemical, and radiological weapons, but exclude the means of transporting or propelling the weapon where such means is a separable and divisible part of the weapon.”<sup>39</sup>

A UK House of Lords European Committee Report from 2004-05 defines WMD as, “nuclear, biological, and chemical weapons – irrespective of particular characteristics, potency and possible application.”<sup>40</sup> An anomalous definition is used in the *United States Government Interagency Domestic Terrorism Concept of Operations Plan*, which states that:

A WMD is any device, material, or substance used in a manner, in a quantity or type, or under circumstances evidencing an intent to cause death or serious injury to persons or significant damage to property.<sup>41</sup>

This definition is somewhat more problematic as the claim could be made that the crudely fashioned steel machetes used in the mass killing of 800 000 Rwandan Hutus and Tutsis were weapons of mass destruction. Fortunately some official international uses of the term WMD are simpler and straightforward. The WMD Branch of the United Nations Department for Disarmament Affairs defines WMD as “nuclear, chemical and biological weapons.”<sup>42</sup>

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<sup>38</sup> “United Nations Security Council Resolutions – 1947, Resolution 18: Armaments: Regulation and Reduction Of.” United Nations, accessed 21 December 2009, <http://www.un.org/documents/sc/res/1947/scres47.htm>.

<sup>39</sup> This definition is also used by the Central Intelligence Agency in its assessment of Iraq’s proscribed weapons programmes. “Comprehensive Report of the Special Advisor to the DCI on Iraq’s WMD, 30 September 2004;” “Dictionary of Military and Associated Terms, 23 March 2004,” US Department of Defense, Joint Staff, Joint Staff Publication 1-02, accessed 27 August 2009, [http://www.dtic.mil/doctrine/jel/new\\_pubs/jp1\\_02.pdf](http://www.dtic.mil/doctrine/jel/new_pubs/jp1_02.pdf).

<sup>40</sup> House of Lords, European Committee, *Preventing Proliferation of Weapons of Mass Destruction: The EU Contribution*, 13<sup>th</sup> Report of Session 2004-05, 5 April 2005, 7.

<sup>41</sup> United States Government Interagency Domestic Terrorism Concept of Operations Plan, January 2001, B-5.

<sup>42</sup> “Mission Statement, WMD Branch of the United Nations Department for Disarmament Affairs.” United Nations, accessed 9 September 2009, <http://disarmament.un.org:8080/wmd>.

One of the main issues with using WMD is it “tends to blur the distinctive attributes of, and differences among, nuclear, biological, and chemical weapons.”<sup>43</sup> Weapons in these categories vary significantly in terms of their potential lethality as well as the difficulty in actually developing or otherwise obtaining operational capabilities.<sup>44</sup> Dunn, Lavoy and Sagan suggest that, “Ignoring the differences between these weapons, for example, can encourage analysts to ignore how adversaries might use biological or chemical weapons in ways that fall below the threshold at which they would fear a nuclear response.”<sup>45</sup> As Carus explains:

NBC weapons represent a group of weapons that the international community accepts as particularly abhorrent. This distinguishes them from other weapons, such as conventional munitions, that could cause massive death and destruction but that the international community traditionally accepted as routinely usable instruments of armed conflict.<sup>46</sup>

As mentioned, NATO and elements of the US government prefer to use the NBC acronym. While WMD may be a commonly used term in media<sup>47</sup> (and other) circles, for the purposes of this dissertation NBC will be used in describing these three types of weapons.

### *Dissertation Structure*

This dissertation comprises five chapters plus introductory and concluding sections. Chapter One deals with theory. The bureaucratic politics decision-making model will help to shape the theoretical underpinnings of this research project. This particular model de-emphasizes the idea of the unitary actor and promotes the importance of multiple actors. These actors or players tend not to focus on a single strategic issue but on many diverse intra-national problems and according to their various conceptions of national security, organizational, domestic and personal interests. Since my research project is looking at how NBC weapons policy is formed and how decisions are made and the subsequent mutual influences they have had, bureaucratic politics provides a useful foundation.

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<sup>43</sup> John F. Reichert, “Adversary Use of NBC Weapons: A Neglected Challenge,” *Strategic Forum*, Number 187 (December 2001): 2.

<sup>44</sup> Fred W. Schreier, *WMD Proliferation: Reforming the Security to Meet the Threat* (Washington: Potomac Books, 2009), 3.

<sup>45</sup> Lewis A. Dunn, Peter R. Lavoy and Scott D. Sagan, “Conclusions: Planning the Unthinkable,” in *Planning the Unthinkable: How New Powers Will use Nuclear, Biological and Chemical Weapons*, ed. Peter R. Lavoy, Scott D. Sagan and James J. Wirtz. (Ithaca: Cornell University Press, 2000), 240.

<sup>46</sup> Carus, “Defining ‘Weapons of Mass Destruction’”, 8.

<sup>47</sup> See Ibid. for *New York Times* analysis.

Chapter Two is the methodology section of the dissertation. This will include a detailed look at the benefits of multiple versus single cases, actual case study selection criteria, and justifications for each individual case study chosen as well as a discussion of methods used to test the empirical cases, which in this instance is a process tracing methodology.

Chapter Three is the first of the two historical case studies – this one is on the United Kingdom from 1946-57. Looking back at the origins of the British NBC programmes will be helpful as it can assist in pinpointing key shifts in thinking about these types of weapons. For example, in July 1947, the UK Defence Research Policy Committee (DRPC) recommended to the Attlee government that, “research on chemical and biological weapons should be given priority effectively equal to that given to the study of atomic weapons.”<sup>48</sup> What was happening at this time to elicit this type of response from the DRPC? By looking at past events, one can hope to gain a level of insight as well as context regarding the environment in which these decisions were made with the expectation of better understanding any substantial connections between nuclear weapons and CBW acquisition.

Chapter Four begins with a look at the history of Iraq’s NBC weapons programmes up to 1995. The focus of analysis will be from 1980 to 1995, which covers the significant episodes in Iraq’s quest for NBC weapons – the bombing of the Osirak reactor in 1981, the Iran-Iraq War, Operation *Desert Storm* and the formation of the United Nations Special Commission (UNSCOM). This particular end date is significant as it was when a large deposit of documents was found at a property belonging to Hussein Kamel, related to its prohibited weapons programmes. This “discovery” was followed by further disclosures by Iraq concerning the production of VX nerve agent and work done on the development of a nuclear weapon. The chapter concludes with an analysis of regime decision-making as well as Iraq’s rationale for developing NBC weapons programmes. Competing interests were a key factor in Iraq’s quest for NBC weapons. Though the regime had a great deal of money to dedicate to each programme, its level of scientific “talent” was limited, meaning that the best and brightest scientists and technical personnel were in great demand. Though Iraq’s decision-making methods were far more idiosyncratic and less formalized than in the UK and other western states,

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<sup>48</sup> Defence Research Policy Committee, Final Version of a Paper on Future of Defence Research Policy, 30 July 1947. TNA DEFE 10/19.

this case study provides us with an excellent example of how NBC related decisions were made in an authoritarian regime.

The fifth chapter draws out the key connections between nuclear weapons on the one hand and CBW on the other, using the UK and Iraq case studies as a basis for analysis, as well as drawing on additional historical data gathered during my research. The reasons why states want to pursue NBC armament are broad and each state has differing criteria for wanting to possess non-conventional weapons. Issues as wide-ranging as national/international prestige, addressing national defence or regional security matters, strategic concerns, economic aspects, military utility and the maintenance of important international relationships or agreements are all causal factors. Also included will be a brief look at a few key issues that may present problems in preventing state-level acquisition of NBC weapons. Though not a comprehensive analysis, it will provide a preliminary look inside a potentially significant set of future challenges.

### *Summary*

Many states have been interested in acquiring nuclear, biological and chemical weapons, for a multitude of reasons. Some have been successful – some have not. The British case study provides a good example of a stable, western, democratic state's decision-making processes and rationale in light of NBC weapons policy. The Iraq study offers a look at how an authoritarian dictatorship makes NBC weapons decisions in a developing nation – primarily by using fear, terror and intimidation as tools of implementation. Both of these cases provide a looking-glass view of other states and their interest in acquiring NBC weapons. Iraq is especially portentous today, as there seems to be no shortage of interest in the supposed “civilian” nuclear energy programme of the Islamic Republic of Iran as well as the weapons programmes of the Democratic People's Republic of Korea (DPRK). By using these historical case studies, the intention is to provide a better understanding of why some states decide to develop nuclear, biological and chemical weapons and how CBW may or do influence policy on nuclear weapons. History has much to teach us and the lessons here need to be understood in order to prevent any future international security crises from arising out of this complex issue.

**TABLE 1. NBC STATE WEAPONS PROGRAMMES – PAST AND PRESENT<sup>49</sup>**

Nuclear weapons	Biological weapons	Chemical weapons
Argentina Australia Brazil <b>Canada</b> China Egypt <b>France</b> India <b>Iraq</b> <b>Israel</b> Libya <b>North Korea</b> Norway Pakistan Romania <b>South Africa</b> Sweden Switzerland Taiwan <b>United Kingdom</b> <b>USA</b> <b>USSR/Russia</b> Yugoslavia	<b>Canada</b> Egypt <b>France</b> Germany Hungary Iran <b>Iraq</b> <b>Israel</b> Italy Japan <b>North Korea</b> <b>South Africa</b> <b>United Kingdom</b> <b>USA</b> <b>USSR/Russia</b>	Australia Belgium Brazil <b>Canada</b> China <b>France</b> Germany India Indonesia Iran <b>Iraq</b> <b>Israel</b> Italy Japan Libya Netherlands <b>North Korea</b> Romania <b>South Africa</b> South Korea Spain Syria Turkey <b>United Kingdom</b> <b>USA</b> <b>USSR/Russia</b> Yugoslavia

KEY: STATES IN **BOLD** HAVE OR HAD A PROGRAMME IN EACH OF THE THREE AREAS

<sup>49</sup> This list details programmes of acquisition begun but often not completed. The states on this list have had, at one time or another, either some form of research programme into NBC technology or a weapons development programme. What is meant by a state “programme” is a complex issue and there are different interpretations that can be utilized. For a look into the problems of state “programmes” and “possession” see Julian Perry Robinson, “Chemical Weapons Proliferation: The Problem in Perspective,” in *Chemical Weapons and Missile Proliferation: With Implications for the Asia/Pacific Region*, ed. Trevor Findlay. (Boulder: Lynne Rienner, 1991), 19-36. Information for biological and chemical weapons compiled from the Sussex Harvard Information Bank, University of Sussex. On the nuclear side, George Perkovich, Jessica T. Matthews, Joseph Cirincione, Rose Gottemoeller, Jon B. Wolfsthal, *Universal Compliance: A Strategy for Nuclear Security* (Washington: Carnegie Endowment, 2007), 20; Richard Rhodes, *Arsenals of Folly: The Making of the Nuclear Arms Race* (New York: Alfred A. Knopf, 2007), 70-71; US Department of Defense, *The Militarily Critical Technologies List Part II: Weapons of Mass Destruction Technologies* (Washington: Office of the Under Secretary of Defense for Acquisition and Technology, February 1998), Section 5, 9.

## CHAPTER 1

### THEORY

The primary purpose of any theory is to clarify concepts and ideas that have become, as it were, confused and entangled.<sup>1</sup>

- Carl von Clausewitz, *On War*

Theory, as nineteenth century Prussian military strategist Carl von Clausewitz stated, “need not be a positive doctrine, a sort of manual for action.”<sup>2</sup> Theory should be something to help guide the research, but not overshadow it.<sup>3</sup> For the purpose of this research project, the use of theory is to provide a set of “guiding principles” to be used in the collection and analysis of data and not as a rigid framework set up to organize the sum of the research. Clausewitz also wrote that, “It (theory) is an analytical investigation leading to a close acquaintance with the subject; applied to experience.... it leads to thorough familiarity with it.”<sup>4</sup> In this case, the use of theory will also help frame the research questions in an appropriate context. This is important as one of the biggest challenges faced by a researcher is the identification of theoretical constructs relevant to their research. In fact, there are few theoretical constructs that have not been censured for their “conservative bias, neglect to change and its consequent reification of the status quo.”<sup>5</sup> Fortunately there is no right or wrong answer when it comes to selecting a theoretical approach – there are only choices. According to Morton Kaplan, “Political scientists and theorists cannot reason without generalization and, where matters are complex, the web of reasoning logically takes the form of a theory.”<sup>6</sup>

This research project draws on the fields of International Relations (IR), diplomatic history and strategic thought and choosing a suitable theoretical approach that reflects the interdisciplinary nature of the project is exigent. According to Julie Thompson Klein, “educators, researchers and practitioners have all turned to interdisciplinary work

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<sup>1</sup> Carl von Clausewitz, *On War*, trans. Michael Howard and Peter Paret (Princeton: Princeton University Press, 1984), 132.

<sup>2</sup> Ibid., 141.

<sup>3</sup> Theory is taken to mean, “any mental construct that orders phenomena or inquiry into them.” Harry Eckstein, “Case Study and Theory in Political Science,” in *Handbook of Political Science, Volume 7*, ed. F. J. Greenstein and N. W. Polsby. (Reading: Addison-Wesley, 1975), 86.

<sup>4</sup> Clausewitz, *On War*, 141.

<sup>5</sup> R. B. J. Walker, *Inside/Outside: International Relations as Political Theory* (Cambridge: Cambridge University Press, 1993), 113.

<sup>6</sup> Morton A. Kaplan, “Problems of Theory Building and Theory Confirmation in International Politics,” in *The International System: Theoretical Essays*, ed. Klaus Knorr and Sidney Verba. (Princeton: Princeton University Press, 1961), 6.

in order to accomplish a range of objectives including the need to answer complex questions; to address broad issues; and to solve problems that are beyond the scope of any one discipline.”<sup>7</sup> Interdisciplinary research can lead researchers in different disciplines to, “meet at the interfaces and frontiers of those disciplines and even to cross frontiers to form new disciplines.”<sup>8</sup> Each of IR theory, diplomatic history and strategic thought will help to provide insight into the final analysis of the stated research questions. These academic fields share a few commonalities between them. First, diplomatic historians and IR theorists share the objective of trying to uncover and understand their common history.<sup>9</sup> Second, they both share a universal commitment to objective evidence in regard to subject matter.<sup>10</sup> Third, they both share a focus on people and the ways they organize their affairs, or nonreplicable phenomena.<sup>11</sup> Fourth, political events have, as a rule, provided the substance for historical synthesis, which in turn necessitates some level of theoretical analysis.<sup>12</sup> Finally, the use of structured, focused comparison – or what is called process tracing in IR and historical explanation (narrative) in history – provides an analogous methodology that bridges the disciplines.<sup>13</sup>

Selecting a theory that is able to satisfy requirements arising from either discipline has resulted in the adoption of certain elements of more than one theoretical framework. First, the bureaucratic politics model of decision-making will be drawn on to help inform the analysis developed throughout this research project.<sup>14</sup> Elements of historical analysis and strategic thinking will also factor into the overall analysis of how and why governments make decisions vis-à-vis nuclear, biological and chemical

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<sup>7</sup> Julie Thompson Klein, *Interdisciplinarity: History, Theory, and Practice* (Detroit: Wayne State University Press, 1990), 11.

<sup>8</sup> Committee on Science, Engineering, and Public Policy, *Facilitating Interdisciplinary Research* (Washington: The National Academies Press, 2004), 16.

<sup>9</sup> Colin Elman and Miriam Fendius Elman, “History vs. Neo-realism: A Second Look,” *International Security*, Volume 20, Number 1 (Summer 1995): 5-6.

<sup>10</sup> Stephen H. Haber, David M. Kennedy, and Stephen D. Krasner, “Brothers Under the Skin: Diplomatic History and International Relations,” *International Security*, Volume 22, Number 1 (Summer 1997): 34.

<sup>11</sup> John L. Gaddis, “History, Theory, and Common Ground,” *International Security*, Volume 22, Number 1 (Summer 1997): 82.

<sup>12</sup> Ian S. Lustick, “History, Historiography, and Political Science: multiple Historical Records and the Problem of Selection Bias,” *The American Political Science Review*, Volume 90, Number 3 (September 1996): 605.

<sup>13</sup> Alexander L. George, “Knowledge for Statecraft: The Challenge for Political Science and History,” *International Security*, Volume 22, Number 1 (Summer 1997): 47.

<sup>14</sup> In his 1971 book *Essence of Decision: Explaining the Cuban Missile Crisis*, Graham Allison employs the term governmental politics as opposed to bureaucratic politics. This can be a little bit confusing to the reader as Allison and Morton H. Halperin used the latter term in their influential paper, “Bureaucratic Politics: A Paradigm and Some Policy Implications,” *World Politics*, Volume 24 (Spring 1972), as does Halperin in his book, *Bureaucratic Politics and Foreign Policy* (Washington: Brookings Institute, 1974). Though the 1999 edition is the one used throughout this chapter, I have endeavoured to use *bureaucratic* as opposed to *governmental* wherever possible.



weapons. In this case, how a decision or set of decisions lead to the formation of policy related to the particular weapons system. Strategic thinking, or simply strategy, is, according to Bernard Brodie, “a how to do it study – a guide for accomplishing something and doing it efficiently.”<sup>15</sup> Decisions about NBC weapons are rarely made in isolation and a number of causal factors exist as to why states want these types of weapons. Strategic thinking can help to provide context and background into the conditions in which these types of decisions were made.

### *Bureaucratic Politics*

In *Essence of Decision: Explaining the Cuban Missile Crisis* (1971), Graham Allison remarked that in thinking about problems of foreign affairs, “professional analysts as well as ordinary citizens proceed in a straightforward, informal, nontheoretical fashion.”<sup>16</sup> According to Allison, “most analysts explain and predict behaviour of national governments in terms of a rational actor model.”<sup>17</sup> In the rational actor model, the rational decision problem is reduced to a simple matter of selecting among a set of given alternatives, each of which has a given set of consequences: the agent selects the alternative whose consequences are preferred in terms of the agent’s utility function which ranks each set of consequences in order of preference.<sup>18</sup> Hollis and Smith believe that a rational actor model in international politics is, “more basic than a theory about states pursuing national interests.”<sup>19</sup> The rational actor has universal appeal. In many circumstances it appears to provide a logical explanation of a particular event or set of events. Often there is a straightforward conclusion to the issues posed by a particular case study. In these instances the rational actor model would provide a sufficient explanation.<sup>20</sup> In *Essence of Decision*, Allison uses three different conceptual decision-making models, which are: (a) rational actor, (b) organizational behaviour and (c) bureaucratic politics; in his analysis of the Cuban Missile Crisis. All three models provide a different explanation of some of President John Kennedy’s decisions during

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<sup>15</sup> Bernard Brodie, “Why Were We So (Strategically) Wrong?” *Foreign Policy*, Number 5 (Winter 1971-72): 151.

<sup>16</sup> Graham T. Allison and Philip Zelikow, *Essence of Decision: Explaining the Cuban Missile Crisis* (New York: Longman, 1999), 3-4.

<sup>17</sup> *Ibid.*, 4.

<sup>18</sup> *Ibid.*, 17.

<sup>19</sup> Martin Hollis and Steve Smith, “Roles and Reasons in Foreign Policy Decision Making,” *British Journal of Political Science*, Volume 16, Number 3 (July 1986): 272.

<sup>20</sup> See Appendix 1: A Typology of Policymaking.

the 1962 crisis. However, for the purpose of this research project the one that is of the most interest is bureaucratic politics.<sup>21</sup>

To start, the bureaucratic politics model sees no unitary actor, but rather many actors as players – players who focus not on a single strategic issue but on many diverse intra-national problems.<sup>22</sup> These players choose in terms of no consistent set of strategic objectives, but rather according to various conceptions of national security, organizational, domestic and personal interests. Players make governmental decisions not by a single rational choice, but by pulling and hauling.<sup>23</sup> As I. M. Destler explains:

Bureaucratic politics is the process by which people inside a government bargain with one another on complex public policy questions. Its existence does not connote impropriety, though such may be present. Nor is it caused by political parties and elections, though both influence the process in important ways. Rather, bureaucratic politics arises from two inescapable conditions. One is that no single official possesses either the power, or the wisdom, or the time to decide all-important executive branch policy issues himself. The second is that officials who have influence inevitably differ in how they would like these issues to be resolved.<sup>24</sup>

A person's stance on an issue derives from their own personal experiences, their career pattern and their position in the bureaucracy.<sup>25</sup> This is reflected by Martin Hollis and Steve Smith when they state, "where you stand would depend both on where you sit and on how you think."<sup>26</sup> Government interaction can, as a result, be understood as a bargaining game with the outcomes resulting from competition.

Typically governments are not monolithic in their outlook or in their decision-making processes. Rather, each individual involved in the process is, in his or her own right, "a player in a central competitive game."<sup>27</sup> This is where the rational actor model and the bureaucratic politics model differ. According to Allison:

The rational actor model simplifies and obscures the persistently neglected fact of bureaucracy as the "maker" of government policy is not one calculating decision-maker, but rather a conglomerate of large organizations and political actors who differ substantially about what

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<sup>21</sup> *Essence of Decision* was first published in 1971, and in 1972, Allison joined with Halperin to formalize the Bureaucratic Politics Paradigm, which was published in the spring edition of *World Politics*. Allison and Halperin, "Bureaucratic Politics," 40-79.

<sup>22</sup> Ibid.

<sup>23</sup> Ibid.

<sup>24</sup> I. M. Destler, *Presidents Bureaucrats and Foreign Policy: The Politics of Organizational Reform* (Princeton: Princeton University Press, 1972), 52.

<sup>25</sup> Morton H. Halperin, *Bureaucratic Politics and Foreign Policy* (Washington: Brookings Institute, 1974), 84.

<sup>26</sup> Hollis and Smith, "Roles and Reasons in Foreign Policy Decision Making," 273.

<sup>27</sup> Allison and Zelikow, *Essence of Decision*, 255.

their government should do on an particular issue and who compete in attempting to affect both governmental decisions and the actions of their government.<sup>28</sup>

Decisions have less to do with consequences than with compromises. Richard Neustadt, in *Presidential Power and the Modern Presidents: The Politics of Leadership from Roosevelt to Reagan*, demonstrated that, “the power of our highest official is basically just ‘the power to persuade,’ and that the ‘power to persuade is the power to bargain’.”<sup>29</sup> This highlights the need for the President to work very hard building support within the government for what he/she wants to accomplish.

The number of individuals involved in the early days of forming nuclear weapons policy was very small and within this group there were different opinions as to why the UK should develop nuclear weapons. National defence, prestige and economics were all factors in the decision to go for nuclear weapons, but the path in getting there was difficult and many compromises had to be made. Clearly, there is room for different programmes pursuing principles important to specific segments of society. However, when one reaches the political-military field, the case for “pluralism” becomes weaker and the need for central control more urgent.<sup>30</sup>

As Allison explains:

The nature of foreign policy problems permits fundamental disagreement among reasonable people about how to solve them. Because most players participate in policy-making by virtue of their role, it is natural that each feels special responsibility to call attention to the ramifications of an issue for his or her domain.<sup>31</sup>

This environment necessitates that government decisions and actions result from a political process. Policy flows from a combination of large organizations and political actors who differ substantially on any particular issue and who compete to advance their own personal and organizational interests as they try to influence decisions.<sup>32</sup>

Decisions on national security and foreign policy questions are made differently in western democratic states as opposed to military dictatorships, communist states and other types of authoritarian regimes. Typically, this can be a process of getting one’s government, “officially and actually committed to some bargaining strategy or tactic,

<sup>28</sup> Allison and Halperin, “Bureaucratic Politics,” 42.

<sup>29</sup> Richard E. Neustadt, *Presidential Power and the Modern Presidents: The Politics of Leadership from Roosevelt to Reagan* (New York: Free Press, 1990), 29-49.

<sup>30</sup> Destler, *Presidents Bureaucrats and Foreign Policy*, 6.

<sup>31</sup> Allison and Zelikow, *Essence of Decision*, 256.

<sup>32</sup> J. Garry Clifford, “Bureaucratic Politics,” *The Journal of American History*, Volume 77, Number 1 (June 1990): 162.

and this involves getting the approval of those officials whose approval is needed, officially and actually.”<sup>33</sup> According to Allison, a number of causal factors must be taken into account in explaining results of group decision-making. These factors can be categorized into seven separate headings, which are: (1) higher quality decisions; (2) the agency problem: principles, agents and players; (3) participants: who plays? (4) decision rules; (5) framing issues and setting agendas; (6) groupthink; and (7) complexity of joint decisions and actions.<sup>34</sup>

For his purpose, Allison contrasts Allied policy-making with that of Nazi Germany during the Second World War. He shows how the Roosevelt administration and the Churchill government adopted systems of committees that produced increasingly high quality, durable judgments. The formation in the UK of the Bacteriological Warfare Subcommittee of the Committee of Imperial Defence is an example of this. Following a study by the Medical Research Council (MRC) that the government asked for in 1934, this subcommittee was set up in November 1936, by the Minister for the Coordination of Defence, Sir Thomas Inskip, to, “report on the practicability of the introduction of bacteriological warfare and to make recommendations as to the countermeasures which should be taken to deal with such an eventuality.”<sup>35</sup> Similar steps were also taken on 10 April 1940 with the first meeting of the Maud Committee, which was tasked with the job of developing a research programme on isotope separation and fast fission.<sup>36</sup>

Committees played a large part in the formation of NBC weapons policy decisions in the UK during the postwar period whereas in Nazi Germany there existed no analogous system of delegated authority to committee decision-making, as power rested primarily with Adolf Hitler. In fact, as Ian Kershaw explains, “Hitler chaired no formal committee after the first years of the regime.”<sup>37</sup> As a result key decisions were made by autonomous organizations or directly by Hitler himself. According to John Cornwell, “In the absence of a rationalized, centralized executive, science and

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<sup>33</sup> Glenn H. Snyder and Paul Diesing, *Conflict Among Nations: Bargaining, Decision Making, and System Structure in International Crises* (Princeton: Princeton University Press, 1977), 349.

<sup>34</sup> See Allison and Zelikow, *Essence of Decision*, 264-294 for a more detailed analysis of these seven causal factors.

<sup>35</sup> Committee of Imperial Defence, 1<sup>st</sup> Meeting of the Subcommittee on Bacteriological Warfare, 2 November 1936. TNA WO 188/648.

<sup>36</sup> The original members of the Maud Committee were Committee Chair Sir George Paget Thomson, Marcus Oliphant, P. B. Moon, Patrick Blackett, James Chadwick and John Cockcroft. Margaret Gowing, *Britain and Atomic Energy: 1939-1945* (London: Macmillan, 1964), 45-89.

<sup>37</sup> Ian Kershaw, “‘Working Towards the Führer.’ Reflections on the Nature of the Hitler Dictatorship,” *Contemporary European History*, Volume 2, Number 2 (July 1993): 106.

technology in the Third Reich were at the whim of competing warlords and commercial and bureaucratic fiefdoms.”<sup>38</sup> This invariably led to a lack of overall direction and cohesion amongst Germany’s military science and technology and weapons-development communities.

Iraq provides us with another interesting study of how NBC weapons decisions were made. According to the final report of The Iraq Survey Group:

The former Regime was Saddam, and he was the one person who made important decisions. It was his assessment of the utility of various policy options that was determinant. It was Saddam’s calculations of risk and timing that mattered.<sup>39</sup>

There was no real notion of an organized set of committees or any sort of inter-agency process. Their decision-making was very nebulous with information getting stove-piped upwards.<sup>40</sup> Iraq under Saddam had all the formal decision-making structures and staff of a modern state, president, national assembly, judiciary, civil service, but these organs did not help formulate or direct national strategic policy. Our ability to understand how decisions were made in Iraq is problematic when looking at it from one particular perspective. They simply did not have any formalized process in making NBC weapons-related decisions.<sup>41</sup>

At first glance, Iraq and bureaucratic politics would seem to be an unusual combination. As Marc Trachtenberg explains, “In order to resolve a problem, one often has to resort to indirect reasoning – to inferences drawn from what one has learned about the bigger picture.”<sup>42</sup> It is from analyzing this bigger picture that a more thorough understanding of the situation can develop. Bureaucratic politics can help shape the types of questions raised and also establish some form of cogency when looking at the Iraq case. As Brad Roberts explains, “When you have a situation that does not seem to follow the archetypal blueprint of governmental decision-making, or there are things that happened that the rational actor model does not explain, then possibly the bureaucratic politics model might be able to provide improved insight.”<sup>43</sup> Former UNSCOM Deputy Executive Chairman Robert Gallucci thinks that the strengths of

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<sup>38</sup> John Cornwell, *Hitler’s Scientists: Science, War and the Devil’s Pact* (London: Penguin Books, 2003), 28.

<sup>39</sup> Comprehensive Report of the Special Advisor to the DCI on Iraq’s WMD – 30 September 2004, Volume I, 3. Will be referred to as ISG Report.

<sup>40</sup> Interview with Steve Black, 8 April 2008.

<sup>41</sup> Ibid.

<sup>42</sup> Marc Trachtenberg, *History and Strategy* (Princeton: Princeton University Press, 1991), 265.

<sup>43</sup> Interview with Brad Roberts, 7 April 2008.

bureaucratic politics is its ability to help explain a particular phenomenon that does not have a perfectly adequate, rational explanation.<sup>44</sup> Decision-making in Iraq during this particular time period was anything but rational. Consequently, the rational actor model is inadequate when trying to explain the nuances of NBC weapons decision-making within Iraq.

Theories gain strength through empirical testing and the bureaucratic politics model is no different. According to David Welch, students of international politics have largely failed to build upon and test the theory at what he calls the “intra-governmental level of analysis.”<sup>45</sup> While there have been attempts to test the model, the body of literature is not very big.<sup>46</sup> Though as valuable as it may be, testing the bureaucratic politics model falls outside the boundaries of this research project.<sup>47</sup>

Like many other theoretical tools, the bureaucratic politics model does not always provide an ideal explanation of the evidence presented. It is however, a useful tool in helping to better understand the nuclear, biological and chemical weapons decision-making processes in Britain and Iraq, though not the only interpretative tool used throughout the dissertation.

### *Historical Analysis*

Historical analysis helps provide context for theory. Historians, according to Jack Levy, “describe, explain, and interpret individual events or a series of events, whereas political scientists generalize about the relationships between variables and construct law-like statements about social behaviour.”<sup>48</sup> As Dennis Kavanagh states:

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<sup>44</sup> Interview with Robert Gallucci, 9 April 2008.

<sup>45</sup> David A. Welch, “The Organizational Process and Bureaucratic Politics Paradigms: Retrospect and Prospect,” *International Security*, Volume 17, Number 2 (Autumn 1992): 114.

<sup>46</sup> For examples that attempt to test the bureaucratic politics model see Lauren Holland, “The US Decision to Launch Operation Desert Storm: A Bureaucratic Politics Analysis,” *Armed Forces & Society*, Volume 25, Number 2 (Winter 1999): 219-242; Edward Rhodes, “Do Bureaucratic Politics Matter? Some Disconfirming Findings from the Case of the U.S. Navy,” *World Politics*, Volume 47, Number 1 (October 1994): 1-41; Leon V. Sigal, “Bureaucratic Politics & Tactical Use of Committees: The Interim Committee & the Decision to Drop the Atomic Bomb,” *Polity*, Volume 10, Number 3 (Spring 1978): 326-364; Steve Smith, “Policy Preferences and Bureaucratic Position: The Case of the American Hostage Rescue Mission,” *International Affairs*, Volume 61, Number 1 (Winter 1984-85): 9-25; Jiri Valenta, “The Bureaucratic Politics Paradigm and the Soviet Invasion of Czechoslovakia,” *Political Science Quarterly*, Volume 94, Number 1 (Spring 1979): 55-76; Steve A. Yetiv, “Testing the Government Politics Model: US Decision Making in the 1990-91 Persian Gulf Crisis,” *Security Studies*, Volume 11, Number 2 (2001): 50-84.

<sup>47</sup> See section on *Areas for Future Research*, pages 215-217.

<sup>48</sup> Jack S. Levy, “Too Important to Leave to the Other: History and Political Science in the Study of International Relations,” *International Security*, Volume 22, Number 1 (Summer 1997): 22.

We rely on historians to tell us about the causes, events and immediate effects of the French Revolution, of the 1832 Reform Act, of the 1914-18 war and so on, but we also rely on them to give meaning to the past.<sup>49</sup>

History exists not simply as a tool for proving or disproving theory, but as a way of being able to understand how past events can affect future problems. Too many research projects have become saturated with what Albert Hirschman has referred to as “compulsive and mindless theorizing.”<sup>50</sup> While theory can help frame research questions and direct the thrust of the research, it is no substitute for empirical evidence. As Haber, Kennedy and Krasner explain, “truth resides ultimately in the facts, though theory laden they may be.”<sup>51</sup>

History has long been criticized as being more of a tool for research as opposed to a structured theoretical framework. Richard Rosecrance believes one criticism that can be leveled is that “historical data do not comprise a fixed, integrated body of knowledge, that they are merely facts.”<sup>52</sup> More recently, history has come under heavy criticism for having, “a largely descriptive purpose.”<sup>53</sup> Historians tend to construct narrative-based explanations rather than theory-based explanations. Historians also study the past rather than focus on the present, “they seek to understand single unique events rather than generalize about classes of events and they tend to prefer complex multi-causal explanations as opposed to mono-causal explanations.”<sup>54</sup>

Having hypotheses and conclusions that are generalizable is important but one must not forget that in constructing the narrative for an historical case study, generalizations are either quite incidental to their primary task of describing and explaining a series of events or episodes, implicitly rather than explicitly, or they are restricted to generalizations about a well-defined period of time.<sup>55</sup> Generalizations create an appearance of authoritative knowledge on behalf of the theorist and as we have seen, the failure to predict some of the major events of the twentieth century have left theorists wondering if there is more they can do to accurately predict the outcome of

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<sup>49</sup> Dennis Kavanagh, “Why Political Science Needs History,” *Political Studies*, Volume 39, Number 3 (September 1991): 483.

<sup>50</sup> Albert O. Hirschman, “The Search for Paradigms as a Hindrance to Understanding,” *World Politics*, Volume 22, Number 3 (April 1970): 329.

<sup>51</sup> Haber, et al, “Brothers Under the Skin,” 37.

<sup>52</sup> Richard Rosecrance, *International Relations: Peace or War?* (New York: McGraw-Hill, 1973), 26.

<sup>53</sup> Kim Salomon, “What’s the Use of International History?” *Journal of Peace Research*, Volume 30, Number 4 (November 1993): 376.

<sup>54</sup> Colin Elman and Miriam Fendius Elman, “Diplomatic History and International Relations Theory: Respecting Differences and Crossing Boundaries,” *International Security*, Volume 22, Number 1 (Summer 1997): 5-11.

<sup>55</sup> Levy, “Too Important to Leave to the Other,” 30.

future events to the benefit of this type of theory.<sup>56</sup> It is here where historical analysis can provide insight and as Edward Ingram states:

The historian's description is a form of analysis (it explains); likewise, narrative (which has nothing to do with chronology) is applied theory, an analytical test of a proposition: each presupposes the other and, without the other, neither can be carried out.<sup>57</sup>

The ability to have generalizable conclusions is of paramount importance within the study of theory. John Gaddis argues that, "visions of any future have to proceed from the awareness of some kind of past, otherwise there can be no conceptual frame of reference."<sup>58</sup> Gaddis also states that, "Unlike history, (political science) theory seems to assume that simple mechanisms drive human events, and that if we can only discover what they are, we can use them to make predictions."<sup>59</sup> While it is crucial to have a theory in place to help direct the overall research project, the question of what can be learned from the lessons of the past to help understand why modern states want to acquire NBC weapons is the desired endgame. Alexander George believes that in order to accomplish this, one must convert what he calls "the lessons of history" into a comprehensive theory that encompasses the activity or situation in question.<sup>60</sup> He goes on to state that this can be accomplished through intellectual cooperation between historians and political scientists in order to contribute to the development of policy-related theory.<sup>61</sup>

### *Strategic Thought*

In the 1950s, strategy emerged within the United States as a new field with intellectual qualities distinct to that of (diplomatic) history and political science.<sup>62</sup> In his influential book *The Strategy of Conflict*, Thomas Schelling wrote, "Strategy analyzes and explains the maze of actions and reactions as more or less advantageous moves in a game

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<sup>56</sup> Refer to Peter M. Haas, "Introduction: Epistemic Communities and International Policy Coordination," *International Organization*, Volume 46, Number 1 (Winter 1992): 1-35.

<sup>57</sup> Edward Ingram, "The Wonderland of the Political Scientist," *International Security*, Volume 22, Number 1 (Summer 1997): 53.

<sup>58</sup> John L. Gaddis, "International Relations Theory and the End of the Cold War," *International Security*, Volume 17, Number 3 (Winter 1992-93): 6-7.

<sup>59</sup> Gaddis, "History, Theory and Common Ground," 78.

<sup>60</sup> Alexander L. George, "Case Studies and Theory Development: The Method of Structured, Focused Comparison," in *Diplomacy: New Approaches in History, Theory, and Policy*, ed. Paul Gordon Lauren. (New York: Free Press, 1979), 43.

<sup>61</sup> *Ibid.*, 43-44.

<sup>62</sup> Trachtenberg, *History and Strategy*, 3.



of interdependent conflict.”<sup>63</sup> He goes on to state that strategic behaviour seeks to influence another actor’s choice by working on his expectations of how his behaviour is related to one’s own.<sup>64</sup> The strategy of pure conflict, or *game theory*, defined as a game in which, though the element of conflict provides the dramatic interest, mutual dependence is part of the logical structure and demands some kind of collaboration or mutual accommodation, has provided significant insight and advice.<sup>65</sup> Duncan Snidal believes that the real power of game theory, for both empirical and theoretical purposes, emerges when it is used to generate new findings and understandings rather than to reconstruct individual situations.<sup>66</sup> Schelling states, “game theory is concerned with situations – games of strategy as opposed to games of skill or games of chance – in which the best course of action for each participant depends on what he expects the other participants to do.”<sup>67</sup>

Strategy is influenced by one’s own strategic doctrine, which, according to Fritz Ermarth, consists of, “a set of operative beliefs, values, and assertions that in a significant way guides official behaviour with respect to strategic research and development, weapons choice, forces and operational plans.”<sup>68</sup> Strategic theory, as Clausewitz explains, “must study the engagement in terms of its possible results and of the moral and psychological forces that largely determine its course.”<sup>69</sup> The concept of *strategic culture* has undergone resurgence of late.<sup>70</sup> According to Kerry Kartchner, “it has become essential to better understand the reasons; incentives; and rationales for acquiring, proliferating and employing weapons of mass destruction by diverse actors

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<sup>63</sup> Thomas C. Schelling, *The Strategy of Conflict* (Cambridge: Harvard University Press, 1960), 4-5.

<sup>64</sup> Ibid, 5.

<sup>65</sup> Ibid, 83.

<sup>66</sup> Duncan Snidal, “The Game Theory of International Politics,” *World Politics*, Volume 38, Number 1 (October 1985): 28.

<sup>67</sup> Schelling, *The Strategy of Conflict*, 9-10.

<sup>68</sup> Fritz Ermarth, “Contrasts in American and Soviet Strategic Thought,” *International Security*, Volume 3, Number 2 (Autumn 1978): 138.

<sup>69</sup> Clausewitz, *On War*, 177.

<sup>70</sup> *Strategic Culture and Weapons of Mass Destruction: Culturally Based Insights into Comparative National Security Policymaking*, ed. Jeannie L. Johnson, Kerry M. Kartchner and Jeffrey A. Larsen. (New York: Palgrave Macmillan, 2009); Huiyun Feng, *Chinese Strategic Culture and Foreign Policy Decision-Making: Confucianism, Leadership and War* (Oxford: Routledge, 2007); Barry R. Schneider and Jerrold M. Post, *Know Thy Enemy: Profiles of Adversary Leaders and Their Strategic Cultures* (Washington: US Government Printing Office, 2004); Ijaz Khan, *Pakistan’s Strategic Culture and Foreign Policy Making* (New York: Nova Publishers, 2007); James M. Smith, Jerry Mark Long and Thomas H. Johnson, *Strategic Culture and Violent Non-State Actors: Weapons of Mass Destruction and Asymmetrical Operations Concepts and Cases*, INSS Occasional Paper 64 (Colorado: USAF Academy, February 2008). Asle Toje, *America, the EU and Strategic Culture: Renegotiating the Transatlantic Bargain* (London: Routledge, 2008); Lawrence Sondhaus, *Strategic Cultures and Ways of War* (London: Routledge, 2006); Lynn Eden, *Whole World on Fire: Organizations, Knowledge, & Nuclear Weapons Devastation* (Ithaca: Cornell University Press, 2004).

under circumstances that differ significantly from those for which previous analytical constructs now seem inadequate or irrelevant.”<sup>71</sup>

As an example, by the end of the Second World War the Soviet Union replaced Germany as the predominant security threat to the West. Though the USSR had been a full partner during the war, the Allies understood very little about how it operated and what its thoughts on strategic issues were.<sup>72</sup> Fritz Ermarth writes:

Traditional Russian strategic culture – that of Imperial Russia from its emergence as a state in the middle of the last millennium through most of the existence of the Soviet Union into the late 1980s – has been one of the most martial and militarized such cultures in history, rivaling, if not exceeding, those of Prussia, Imperial and Nazi Germany, and Imperial Japan in this respect.<sup>73</sup>

Relations with the Soviet Union would undergo a restructuring in the late postwar period. In 1961 the USA and USSR concluded negotiations on an agreement designed to create a framework for future disarmament talks. The main provisions of The Joint Statement of Agreed Principles for Disarmament Negotiations were, according to Charles Price:

the elimination of all national military establishments, leaving only lightly armed militia for internal police purposes; the endowing of the UN with the proper authority to settle disputes peacefully and with a peace force able to deter any illegal use of force internationally; and the establishment of an International Disarmament Organization with the necessary capabilities, including the right of unrestricted access for on-site inspection, to assure all nations that the agreement was adhered to.<sup>74</sup>

More specifically, Article 3(b) called for the “elimination of all stockpiles of nuclear, chemical, bacteriological and other weapons of mass destruction, and the cessation of the production of such weapons” while Article 3(c) referred to “the elimination of all

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<sup>71</sup> Kerry M. Kartchner, “Strategic Culture and WMD Decision Making,” in *Strategic Culture and Weapons of Mass Destruction: Culturally Based Insights into Comparative National Security Policymaking*, ed. Jeannie L. Johnson, Kerry M. Kartchner and Jeffrey A. Larsen. (New York: Palgrave Macmillan, 2009), 55.

<sup>72</sup> See David Holloway, *The Soviet Union and the Arms Race* (New Haven: Yale University Press, 1983); Michael McGwire, *Military Objectives in Soviet Foreign Policy* (Washington: The Brookings Institution, 1987).

<sup>73</sup> Fritz W. Ermarth, “Russian Strategic Culture in Flux: Back to the Future?” in *Strategic Culture and Weapons of Mass Destruction: Culturally Based Insights into Comparative National Security Policymaking*, ed. Jeannie L. Johnson, Kerry M. Kartchner and Jeffrey A. Larsen. (New York: Palgrave Macmillan, 2009), 84.

<sup>74</sup> Charles C. Price, “The Case for Disarmament: Some Personal Reflections on the United States and Disarmament,” *Annals of the American Academy of Political and Social Science*, Volume 469 (September 1983): 146.

means of delivery of weapons of mass destruction.”<sup>75</sup> This would prove to be significant and as Marshall Shulman stated, “the relationship between the two countries was about to enter a new stage.”<sup>76</sup>

Having an understanding of your adversaries’ decisions and expectations about their behaviours is paramount to gaining insight into decisions on nuclear, biological and chemical weapons acquisition.<sup>77</sup> Johnson, Kartchner and Larsen state:

When a nation state or a group considers what its actions and policies are going to be regarding WMD, it faces a range of choices. It can renounce pursuing the acquisition of WMD, and submit to international standards and regimes of nonproliferation. Or, it can choose to pursue acquiring the technology to lay the basis for a future decision to develop nuclear, chemical, or biological weapons without actually proceeding to the manufacture of such weapons, but only to give it the option of doing so if circumstances change in the future.<sup>78</sup>

The importance a plurality of states place on national defence and security cannot be overstated. How a state defines its national security concerns will likely have a discernable effect in regard to its views on non-conventional weapons technology.<sup>79</sup>

Closely related to this is the concept of deterrence or deterrence theory. Since the end of the Second World War the concept of deterrence has occupied a prominent place amongst strategic thinkers. Deterrence is a strategy by which governments threaten retaliation if attacked, such that aggressors are deterred if they do not wish to suffer great damage as a result of an aggressive action.<sup>80</sup> According to Michael Quinlan, “deterrence works by displaying the prospect of costs in terms of values prized by the

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<sup>75</sup> Text of the “Joint Statement of Agreed Principles for Disarmament Negotiations” of the Soviet Union and the United States dated 20 September 1961. Reproduced in *Current Disarmament Proposals as of March 1, 1964* (New York: World Law Fund, 1964), 190.

<sup>76</sup> Marshall D. Shulman, “Toward a Western Philosophy of Coexistence,” *Foreign Affairs*, Volume 52, Number 1 (October 1973): 35.

<sup>77</sup> Schelling, *The Strategy of Conflict*, 3.

<sup>78</sup> Jeannie L. Johnson, Kerry M. Kartchner and Jeffrey A. Larsen, “Introduction,” in *Strategic Culture and Weapons of Mass Destruction: Culturally Based Insights into Comparative National Security Policymaking*, ed. Jeannie L. Johnson, Kerry M. Kartchner and Jeffrey A. Larsen. (New York: Palgrave Macmillan, 2009), 4.

<sup>79</sup> This is reflected by Martin Hollis and Steve Smith’s belief that, where you stand on a particular issue would depend both on where you sit and on how you think. Refer back to Chapter One of this dissertation. Hollis and Smith, “Roles and Reasons in Foreign Policy Decision Making,” 273.

<sup>80</sup> Schelling argues that, “The idea of deterrence figures so prominently in some areas of conflict other than international affairs that one might have supposed the existence of a well-cultivated theory already available to be exploited for international applications. Deterrence has been an important concept in criminal law for a long time. Legislators, jurists, lawyers, and legal scholars might be supposed to have subjected the concept to rigorous and systematic scrutiny from many generations.” Schelling, *The Strategy of Conflict*, 10.

deterree.”<sup>81</sup> A general deterrence posture can be maintained through the threat of attack with nuclear weapons, chemical and biological weapons, non-nuclear ordnance or overwhelming conventional military strength.

The idea of deterrence is not new and it has been an important concept in criminal law for a long time.<sup>82</sup> According to Bernard Brodie:

The threat of war, open or implied has always been an instrument of diplomacy by which one state deterred another from doing something of a military or political nature, which the former did not wish the latter to do.<sup>83</sup>

Within the larger concept of deterrence is *immediate* and *general* deterrence. Immediate deterrence refers to the relationship between opposing states where at least one side is seriously considering an attack while the other is mounting a threat of retaliation in order to prevent it. Whereas general deterrence refers to adversaries who maintain armed forces to regulate their relationship even though neither is anywhere near mounting an attack.<sup>84</sup> The doctrine of Mutual Nuclear Deterrence characterized relations between the United States and the former Soviet Union from the early 1960s to the 1980s. Achen and Snidal claim that rational deterrence is very much an ideal-type explanation and that no sensible person pretends that it summarizes typical deterrence decision-making well, or that it exhausts what is to be said about one historical case.<sup>85</sup>

Deterrence theory is an integral part of the realist concept of *Realpolitik*.<sup>86</sup> I share the primary realist assumption that states are concerned principally with issues affecting their survival.<sup>87</sup> More specifically, realists conclude that because conflict is an

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<sup>81</sup> Michael Quinlan, *Thinking About Nuclear Weapons: Principles, Problems, Prospects* (Oxford: Oxford University Press, 2009), 31.

<sup>82</sup> Schelling, *The Strategy of Conflict*, 10.

<sup>83</sup> Bernard Brodie, “The Anatomy of Deterrence,” *World Politics*, Volume 11, Number 2 (January 1959): 174.

<sup>84</sup> Richard Ned Lebow and Janice Gross Stein, “Deterrence and the Cold War,” *Political Science Quarterly*, Volume 110, Number 2 (Summer 1995): 161-162.

<sup>85</sup> Christopher H. Achen and Duncan Snidal, “Rational Deterrence Theory and Comparative Case Studies,” *World Politics*, Volume 41, Number 2 (January 1989): 152.

<sup>86</sup> The Oxford English Dictionary defines *Realpolitik* as, “politics or political doctrine based on practical, rather than moral or ideological, considerations.” Oxford English Dictionary <http://www.oed.com> (accessed 22 February 2009) An early usage of the term can be found in an *Illustrated Review* article from 1872, where it is referred to as, “a so-called matter-of-fact policy, which, from the outset, divesting itself of all ideal demands, expressly aims at nothing but the power and greatness of the nation, and attempts to confine our minds within the narrow sphere of supposed national interests.” “Germany,” *Illustrated Review: A Fortnightly Journal of Literature, Science and Art*, Volume 4, Number 52 (December 1872): 346.

<sup>87</sup> See E. H. Carr, *The Twenty Years Crisis: 1919-1939* (Basingstoke: Macmillan, 1939); Hans J. Morgenthau, *Politics Among Nations: The Struggle for Power and Peace* (New York: Alfred A. Knopf, 1948); Kenneth N. Waltz, *Man, the State and War: A Theoretical Analysis* (New York: Columbia University Press, 1959).

effect of the anarchic structure of the international system, it is likely to continue in the future. According to Kenneth Waltz, “To achieve a favourable outcome from such a conflict a state has to rely on its own devices, the relative efficiency of which must be its constant concern.”<sup>88</sup> John Mearsheimer believes that international relations, “is not a constant state of war, but it is a state of relentless security competition, with the possibility of war always in the background.”<sup>89</sup> It is this conviction of the possibility, indeed, probability of war that drives states to develop the means of guaranteeing their own security by any means necessary, be it through nuclear, biological or chemical weapons, conventional military strength, economic sanctions, political pressures, or any combination of the above.

Since the end of the Cold War much of the West’s nuclear deterrent has been rendered obsolete. The massive stockpiles of strategic and tactical nuclear weapons were designed to deter the former Soviet Union and its allies. Questions arise as to what should constitute an effective modern deterrent against new and emergent threats. Are nuclear weapons still an effective, viable strategic deterrent? Can nuclear weapons, or possibly even CBW, deter rogue states and sub-state terrorist organizations? Although deterrence theory is valuable in helping explain particular variables, it unfortunately says very little about such matters as *how* and *when* states decide that their vital interests are at stake, when deterrence needs to be invoked and when a conflict can be avoided.<sup>90</sup> This raises the question of whether the concept of deterrence is outmoded and no longer of any real, tangible value. As Henry Kissinger explains, “Perhaps the basic problem of strategy in the nuclear age is how to establish a relationship between a policy of deterrence and a strategy for fighting a war in case deterrence fails.”<sup>91</sup> Nuclear, biological and chemical weapons have, and continue to play, a role in certain states’ perceptions of deterrence, defence and national security.

### *Summary*

Historical case studies are valuable tools for identifying patterns of behaviour and establishing a causal chain of events that affect the international system. Proponents

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<sup>88</sup> Waltz, *Man, the State and War*, 159.

<sup>89</sup> John J. Mearsheimer, “The False Promise of International Institutions,” *International Security*, Volume 19, Number 3 (Winter 1994-95): 6.

<sup>90</sup> Robert Jervis, “Introduction: Approach and Assumptions,” in *Psychology and Deterrence: Perspectives on Security*, ed. Robert Jervis, Richard Ned Lebow and Janice Gross Stein. (Baltimore: The Johns Hopkins University Press, 1985), 5.

<sup>91</sup> Henry A. Kissinger, *Nuclear Weapons and Foreign Policy* (New York: Harper & Brothers, 1957), 132.

of case study methodology argue that theoretical development through historical generalization provides a remedy to the ahistorical and overly abstract theory of rational deterrence. History yields rich insights into nuance and context that escape the simpler rational actor models and case studies are therefore essential if the understanding of deterrence is to be grounded in experience and not just in abstract analysis.<sup>92</sup> According to J. Garry Clifford, “historians do not need models that predict perfectly.... they do not seek to build better theories or to propose more effective management techniques.”<sup>93</sup> If one of the primary functions of historical research is to explain the present by increasing our understanding of the past, then a study focusing mainly on current society will not be sufficient.<sup>94</sup>

Although the study of decision-making can yield important generalizations that not only explain a number of cases but also form the basis for further propositions, it still involves examination of details and analysis of idiosyncrasies.<sup>95</sup> Having a malleable theoretical framework is important to an interdisciplinary project like this one. Examining NBC weapons-related decision-making processes in postwar Britain and Saddam Hussein’s Iraq requires a multi-faceted theoretical approach. No single theory would provide a sufficient level of analysis, therefore aspects of different theoretical constructs – namely historical study and strategic theory – need to be incorporated into the overall theoretical approach along with the bureaucratic politics model of governmental decision-making.

Analyses of case studies of this type are inherently valuable in attempting to forecast into the future. Michael Howard states that:

Today most of us would argue that only a knowledge of the past enables us to fully understand the present, and that a failure to read the past correctly warps our capacity to act intelligently in the contemporary world.<sup>96</sup>

By using these two case studies, the belief is that the analysis of historical events will provide a roadmap for future NBC security and proliferation concerns. Paul Gordon Lauren believes that historians and theorists are in a position to provide unique

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<sup>92</sup> Achen and Snidal, “Rational Deterrence Theory and Comparative Case Studies,” 146.

<sup>93</sup> Clifford, “Bureaucratic Politics,” 164.

<sup>94</sup> Michael Howard, *The Lessons of History* (Oxford: Clarendon Press, 1991), 16.

<sup>95</sup> Jervis, “Introduction: Approach and Assumptions,” 5.

<sup>96</sup> Howard, *The Lessons of History*, 188.

contributions to policy-makers seeking to practice diplomacy.<sup>97</sup> In other words, much can be learned from an analysis of this type, using an appropriate methodology and a well-defined theoretical approach.

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<sup>97</sup> Paul Gordon Lauren, "Diplomacy: History, Theory, and Policy," in *Diplomacy: New Approaches in History, Theory, and Policy*, ed. Paul Gordon Lauren. (New York: Free Press, 1979), 11.

## CHAPTER 2

### METHODS

It will be enough for me, however, if these words of mine are judged useful by those who want to understand clearly the events which happened in the past and which (human nature being what it is) will, at some time or other and in much the same ways, be repeated in the future. My work is not a piece of writing designed to meet the taste of an immediate public, but was done to last for ever.<sup>1</sup>

- Thucydides, *History of the Peloponnesian War*

In order to address the specific research questions and hypotheses that I am proposing, case studies are an appropriate methodological tool.<sup>2</sup> As Stephen Van Evera explains:

Specifically, case studies allow the test of predictions about the private speech and writings of policy actors. Often these predictions are singular to the theory that makes them; no other theory predicts the same thoughts or statements. The confirmation of such predictions strongly corroborates the test theory. Case studies are the best format for capturing such evidence. Hence case studies can supply quite decisive evidence for or against political theories.<sup>3</sup>

Additionally, Bent Flyvbjerg believes that:

For researchers, the closeness of the case study to real-life situations and its multiple wealth of details are important in two respects. First, it is important for the development of a nuanced view of reality, including the view that human behavior cannot be meaningfully understood as simply the rule-governed acts found at the lowest levels of the learning process and in much theory. Second, cases are important for researchers' own learning processes in developing the skills needed to do good research. If researchers wish to develop their own skills to a high level, then concrete, context-dependent experience is just as central for them as to professionals learning any other specific skills.<sup>4</sup>

One of the determining factors in deciding to employ a case study methodology involves the type of research questions asked. The central research question that will be

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<sup>1</sup> Thucydides, *History of the Peloponnesian War*, trans. Rex Warner (London: Penguin, 1954), Book One, Introduction, 48.

<sup>2</sup> A case can be defined as a phenomenon for which we report and interpret only a single measure on any pertinent variable. Harry Eckstein, "Case Study and Theory in Political Science," in *Handbook of Political Science, Volume 7*, ed. F. J. Greenstein and N. W. Polsby. (Reading: Addison-Wesley, 1975), 85.

<sup>3</sup> Stephen Van Evera, *Guide to Methods for Students of Political Science* (Ithaca: Cornell University Press, 1997), 54.

<sup>4</sup> Bent Flyvbjerg, "Five Misunderstandings About Case Study Research," *Qualitative Inquiry*, Volume 12, Number 2 (April 2006): 223.



the focus of this dissertation is, why do states decide to acquire NBC weapons, and how have decisions to develop nuclear weapons and decisions to develop chemical and biological weapons, influenced each other? According to Robert Yin, “how and why questions are more explanatory and likely lead to the use of case studies, histories and experiments as the preferred research strategies.”<sup>5</sup> It would seem that the *how* question provides a good opportunity in which to employ a case study methodology.

Case studies offer three formats or methods for testing theories: controlled comparison, congruence procedures and process tracing.<sup>6</sup> It is process tracing that is best suited to this research project. Process tracing is an approach in which the researcher examines the decision-making process by which case conditions are translated into case outcomes.<sup>7</sup> The process tracing method attempts to identify the intervening causal process – the causal chain and causal mechanism, between an independent variable – or variables and the outcome of the dependent variable.<sup>8</sup> In looking at how NBC weapons decisions were made in both the UK and Iraq and how that process evolved, process tracing would seem to be a particularly fitting approach. This is the case as “such questions deal with operational links needing to be traced over time, rather than mere frequencies or incidence.”<sup>9</sup> Van Evera states that, “a thorough process trace can provide a strong test of theory, which is preferred as it transmits more information than other tests.”<sup>10</sup> According to Oisín Tansey, “process tracing provides a crucial method for the analysis of complex political phenomena”<sup>11</sup> and this would include the decisions certain states make in opting to develop nuclear, biological and chemical weapons programmes.

There are some perceived weaknesses in using case studies as a methodological tool. Yin notes the traditional prejudice against the case study strategy and the disdain for the case study strategy held by many researchers.<sup>12</sup> Randy Stoecker also notes the disrepute of case studies among sociologists, who see the case study as “barely better

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<sup>5</sup> Robert K. Yin, *Case Study Research: Design and Methods* (London: Sage, 1984), 18.

<sup>6</sup> Van Evera, *Guide to Methods for Students of Political Science*, 56.

<sup>7</sup> Alexander L. George and Timothy J. McKeown, “Case Studies and Theories of Organizational Decision Making,” in *Advances in Information Processing in Organizations*, ed. Robert Coulam and Richard Smith. (Greenwich: JAI Press, 1985), 35.

<sup>8</sup> Alexander L. George and Andrew Bennett, *Case Studies and Theory Development in the Social Sciences* (Cambridge: MIT Press, 2005), 206.

<sup>9</sup> Yin, *Case Study Research*, 18.

<sup>10</sup> Van Evera, *Guide to Methods for Students of Political Science*, 65.

<sup>11</sup> Oisín Tansey, “Process Tracing and Elite Interviewing: A Case for Non-probability Sampling,” *PS: Political Science and Politics*, Volume 40, Number 4 (October 2007): 771.

<sup>12</sup> Yin, *Case Study Research*, 21-22.

than journalism.”<sup>13</sup> Also, researchers will likely not know what their actual cases are until the data collection as well as the writing up of the results has been completed.<sup>14</sup> However the main criticisms of the case study method deal with the issue of generalization; so one must ask if the data collected can be generalized in any way? While there is no universal answer to this question, the careful selection of relevant cases, designed to provide the most accurate and reliable data set possible can help establish boundaries around the case.

### *Single v. Multiple Cases*

During the initial design phase of a case study, the researcher must determine whether to use either single or multiple cases. While single case studies may have some advantages, they tend to provide a poor platform for identifying a theory’s “antecedent conditions, because most cases provide a backdrop of fairly uniform case conditions.”<sup>15</sup> By using multiple cases, the belief is that the data collected will provide for a more robust examination and analysis of the primary research question.

When using multiple cases, each case is treated as a single case. Each of the case’s conclusions can then be used as information contributing to the whole study, but each case remains a single case. Yin believes that multiple case designs tend to provide evidence that is more compelling, which leads to the overall study being more “robust.”<sup>16</sup> Since different types of states are interested in NBC weapons technology, using two somewhat disparate cases to examine the problem would help to provide a more in-depth analysis of the primary research questions.

One of the problems of using a multiple case design would be that depending on the number of cases, it could be logistically difficult to conduct research in or on each of these cases. Fortunately being based in the UK has made it possible to access a wealth of documentary information located in key university collections and public archives. Access to important UN and other documents that deal with the Iraq programmes, were found mainly online. Choosing the UK and Iraq as a multiple case study project did not prove to be, as King, Keohane and Verba state, “too expensive or arduous to investigate

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<sup>13</sup> Randy Stoecker, “Evaluating and Rethinking the Case Study,” *Sociological Review*, Volume 39 (February 1991): 88.

<sup>14</sup> Charles C. Ragin, “Introduction: Cases of What is a Case?” in *What is a Case? Exploring the Foundations of Social Inquiry*, ed. Charles C. Ragin and Howard S. Becker. (New York: Cambridge University Press, 1992), 6.

<sup>15</sup> Van Evera, *Guide to Methods for Students of Political Science*, 53.

<sup>16</sup> Yin, *Case Study Research*, 48.

more than a few observations.”<sup>17</sup> Had more or possibly different cases been chosen, certain logistical problems might have arisen, however, this did not prove to be the case.

### *Selection Criteria*

One of the challenges inherent to a doctoral research project is determining whether to study cases that are unique in some way, or cases considered to be more typical. Given the limited number of cases that can be studied, cases may be chosen to replicate previous cases or extend emergent theory, or they may be chosen to fill theoretical categories and provide examples of polar types.<sup>18</sup> According to Lijphart, “cases may be selected for analysis because of an interest in the case per se or because of an interest in theory building.”<sup>19</sup> Out of the six different types of case studies that he describes, the one that is most relevant to this is what he terms a hypothesis-generating case study.<sup>20</sup> He describes it in the following manner:

Hypothesis-generating case studies start out with a more or less vague notion of possible hypotheses, and attempt to formulate definite hypotheses to be tested subsequently among a larger number of cases. Their objective is to develop theoretical generalizations in areas where no theory exists yet. Such case studies are of great theoretical value.<sup>21</sup>

These types of case studies are intended to generate new hypothesis as opposed to testing established propositions, which means that they have the greatest value in terms of their contribution to theory.

In terms of selection criteria, some believe that investigators should select cases that best serve the purpose of their inquiry.<sup>22</sup> Unfortunately, practitioners of case studies have yet to produce a comprehensive catalogue of possible case study research designs, or an inclusive list of case selection methods.<sup>23</sup> As a result, the decision of which cases to examine tends to be highly individualistic and typically do not follow any stringent set of guidelines. The criterion for case study selection for this project did not adhere to

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<sup>17</sup> Gary King, Robert O. Keohane and Sidney Verba, *Designing Social Inquiry: Scientific Inference in Qualitative Research* (Princeton: Princeton University Press, 1994), 217.

<sup>18</sup> Kathleen M. Eisenhardt, “Building Theories from Case Study Research,” *Academy of Management Review*, Volume 14, Number 4 (1989): 537.

<sup>19</sup> Arend Lijphart, “Comparative Politics and the Comparative Method,” *The American Political Science Review*, Volume 65, Number 3 (September 1971): 691.

<sup>20</sup> The six types of case studies mentioned are: atheoretical, interpretative case studies, hypothesis-generating case studies, theory-confirming case studies, theory-infirming case studies and deviant case studies. See Lijphart, “Comparative Politics and the Comparative Method.”

<sup>21</sup> *Ibid.*, 692.

<sup>22</sup> Van Evera, *Guide to Methods for Students of Political Science*, 78.

<sup>23</sup> Yin, *Case Study Research*, 27.

a strict set of guidelines or rules. Since the sample size was less than ten, random sampling would not have yielded suitable results, nor would it have helped lend strength to the overall analysis.<sup>24</sup>

It can be said that when the objective is to achieve the greatest possible amount of information on a given problem or phenomenon, “a representative case or a random sample may not be the most appropriate strategy as the typical or average case is often not the richest in information.”<sup>25</sup> An *extreme* or *critical* case is one that deviates from established generalizations.<sup>26</sup> These types of cases are intended to uncover relevant additional information or variables that had not been previously considered.<sup>27</sup> As Flyvbjerg explains:

Atypical or extreme cases often reveal more information because they activate more actors and more basic mechanisms in the situation studied. In addition, from both an understanding-oriented and an action-oriented perspective, it is often more important to clarify the deeper causes behind a given problem and its consequences than to describe the symptoms of the problem and how frequently they occur.<sup>28</sup>

Extreme cases can have great theoretical value especially when paired with a polar type. In order to provide the strongest possible data set, utilizing different cases such as Iraq and the United Kingdom is critical to the overall analysis of this research project.

### *Justifications*

Deciding to use the UK and Iraq as the two case studies provides an interesting contrast between a western democracy and a totalitarian regime. This will prove to be useful in a number of ways. First, while states share some of the same reasons for wanting to develop NBC weapons, their intentions can be contrasting. Why do legitimate, powerful states want to develop and acquire these types of weapons? The UK did, but what can be learned from the British example that might be applicable today? Germany, Japan and Brazil are what can be called latent nuclear weapon states – meaning that they have the industrial capacity and the infrastructure to start up a nuclear weapons programme within a short period of time. Though all three are states parties to the NPT, what could persuade them to break the terms of the treaty and go down the

<sup>24</sup> Refer to Table 1 in the Introduction.

<sup>25</sup> Flyvbjerg, “Five Misunderstandings About Case Study Research,” 229.

<sup>26</sup> In this case the established generalizations refer to the more frequently utilized rational actor model of decision-making. See pages 17-22.

<sup>27</sup> Lijphart, “Comparative Politics and the Comparative Method,” 692.

<sup>28</sup> Flyvbjerg, “Five Misunderstandings About Case Study Research,” 229.

road towards acquiring a nuclear weapons capability? The same could be said for the CWC and the BWC. While it is far less likely that any of these democratic states would abandon these international treaties and regimes, the Soviet Union proceeded to break the terms of the BWC and paid little price for its actions.<sup>29</sup>

Yet another reason is that the UK provides a good example of decision-making methods in a stable, postwar western democracy. The Second World War was the most destructive conflict in history. Loss of life exceeded 55 million and as Richard Overy explains, “destruction was wrought on a scale almost unimaginable fifty years later.”<sup>30</sup> Preventing another large-scale global conflict and protecting one’s population became a high priority in the postwar years. Interest in the military application of nuclear, biological and chemical weapons technology was thought to provide Britain with a significant deterrent capability.

Iraq on the other hand provides an excellent opportunity to study in-depth the reasons why an authoritarian regime might want to develop NBC weapons capabilities. Currently, states such as Iran and North Korea pose a considerable threat. North Korea, for example, announced the termination of the 1994 Agreed Framework<sup>31</sup> between the US and itself, expelled International Atomic Energy Agency (IAEA) inspectors in December 2002, and in January 2003 announced its intention to immediately withdraw from the NPT.<sup>32</sup> The IAEA attempted to convince North Korea to reverse its course and, when this did not happen, reported further North Korean non-compliance over its NPT safeguards agreement to the United Nations Security Council on 12 February 2003. As of 2010, the Security Council has taken no action on this matter.<sup>33</sup>

Iran has been accused of misrepresenting its nuclear energy ambitions. Maintaining that its programme is strictly for energy purposes, questions have arisen as to the validity of its claims.<sup>34</sup> The international community saw this same thing before

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<sup>29</sup> Michael Moodie, “The Soviet Union, Russia and the Biological and Toxin Weapons Convention,” *The Nonproliferation Review* (Spring 2001): 67.

<sup>30</sup> Richard Overy, *Why the Allies Won* (London: Pimlico, 2006), 29.

<sup>31</sup> See, “INFCIRC/457, 2 November 1994.” International Atomic Energy Agency, accessed 15 October 2010, <http://www.iaea.org/Publications/Documents/Infocircs/Others/infocirc457.pdf>.

<sup>32</sup> Larry A. Niksch, “North Korea’s Nuclear Weapons Programme,” Issue Brief for Congress, *Congressional Research Service* (17 March 2003): 2.

<sup>33</sup> “IAEA & NPT - The Verification Challenge: Challenging Nuclear Issues Point the Way Forward.” International Atomic Energy Agency, accessed 10 February 2009, [http://www.iaea.org/Publications/Magazines/Bulletin/Bull462/iaea\\_npt.html](http://www.iaea.org/Publications/Magazines/Bulletin/Bull462/iaea_npt.html).

<sup>34</sup> “Iran aims for 50 000 atomic centrifuges in 5 years,” *Reuters*, 11 December 2007, accessed 15 February 2009, <http://www.reuters.com/article/topNews/idUSBLA15174620071211>; David Albright and Corey Hinderstein, “The Centrifuge Connection,” *Bulletin of Atomic Scientists* (March/April 2004): 61-66; Jay Solomon, “Iran Touts Nuclear Advance Ahead of US Talks,” *The Wall Street Journal*, 6 December 2010,

with the fledgling Iraqi programme in the 1980s and early 90s. It is my belief that by looking at the historical programmes of Saddam Hussein's regime a wealth of information as to why certain states are interested in acquiring NBC weapons will be revealed. The same holds true for the UK case study as well, though it is less likely that western democracies will disregard their commitments to the relevant treaties and conventions and enter into new WMD research and development.

The progression of non-conventional weapons development in most states typically follows the model of chemical first, then biological and then nuclear. The reasons for this are obvious – certain types of chemical weapons are the easiest to research, develop and weaponize. The processes required for the manufacture of mustard gas on a militarily significant scale are not that complex and well within the reach of many states.<sup>35</sup> Some BW agents are more straightforward to grow and cultivate and the Iraqis had success in the production of *Bacillus anthracis* and *Clostridium botulinum*.<sup>36</sup> Lastly, nuclear weapons are the most difficult and expensive of the three to develop. There are a number of states that have had some success with CBW, yet have not achieved a similar level of success with NW. Iraq is a prime example of this. The 7 June 1981 bombing of the Tammuz-1 (Osirak) reactor by the Israeli Air Force prevented Iraq from pursuing the plutonium route of nuclear weapons design and forced them down the uranium enrichment route.<sup>37</sup>

There were a number of logistical considerations that helped influence the selection of Iraq and the UK as the two case studies. For the UK case, one of the most important reasons was the access to primary documents, potential interviewees and other relevant materials. There are many individuals located at universities, think tanks and government agencies in the UK that have tacit knowledge on some aspect of the British NBC weapons programme. Some of them, now retired, were actively involved in these programmes and knew many of the key individuals on a personal level. The National Archives, Kew, London (TNA) proved to be an immense repository of primary documents, as did other relevant collections located at universities across the UK. This helped make the decision to look at the UK a relatively straightforward one.

The case study on Iraq was chosen along similar lines. Many academics,

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accessed 6 December 2010,  
<http://online.wsj.com/article/SB10001424052748704493004576001733790588032.html>.

<sup>35</sup> Interview with Ron Manley, 28 April 2008.

<sup>36</sup> Interview with Amy Smithson, 4 April 2008.

<sup>37</sup> Interview with Leonard Spector, 7 April 2008.

government officials, retired politicians, diplomats and former UN weapons inspectors have experience in dealing with the Iraqi programmes, a significant number of whom I have had access to. The majority of these individuals are situated in a few key areas, namely New York, NY and Washington, DC, with a few others located in European nations. Primary documentation detailing Iraq's proscribed weapons programmes can be found online, most of which has proven to be of great benefit to this research project.

## SOURCES

The case study method can utilize multiple sources and techniques in the data collection process. The researcher determines in advance what evidence to gather and what analysis techniques to use with the data to answer the research questions. Tools to collect data can include surveys, interviews, documentation review, observation and even the collection of physical artifacts. The data gathered for this research project were of a strictly qualitative nature.

### *Analysis of Official Documents and Other Primary Sources*

In order to test the hypotheses raised in this dissertation, primary sources including press releases, speeches, policy documents and official government documentation, produced by relevant experts and officials, have been utilized. There exists a wealth of information on the British NBC programmes at The National Archives. Of special note here are, Records created or inherited by the Air Ministry, the Royal Air Force, and related bodies (AIR), Records created or inherited by the Ministry of Aviation and successors, the Air Force Board, and related bodies (AVIA), Records of the Cabinet Office (CAB), Records created and inherited by the Foreign Office (FO), Records of the Foreign and Commonwealth Office and predecessors (FCO), Records of the Ministry of Defence (DEF), Records of the Atomic Weapons Establishment (ES), Records of the Prime Minister's Office (PREM), Records created and inherited by HM Treasury (T) and Records created or inherited by the War Office, Armed Forces, Judge Advocate General, and related bodies (WO). These files deal with issues concerning the decisions to begin, fund and implement the respective weapons programmes.<sup>38</sup> The National Archives also has correspondence papers from the Prime Ministers Office (PMO) of each administration from 1916 until 1974. It is within this timeframe that

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<sup>38</sup> See Appendix 2 for a select list of relevant TNA files.

every major policy decision regarding the development of British NBC weapons programmes was undertaken. Having unlimited access to the Sussex Harvard Information Bank (SHIB) has proven to be an invaluable resource as it is the most comprehensive private collection of information relating to chemical and biological warfare issues in the United Kingdom.

There are a number of key documents available that deal with Iraq's proscribed weapons programmes. Numerous UNSCOM, United Nations Monitoring Verification and Inspection Commission (UNMOVIC) and IAEA documents exist from this period and many are available in the public domain.<sup>39</sup> Another important resource is the Iraq Survey Group (ISG) report. The ISG was a fact-finding mission sent by the multinational force in Iraq after the conclusion of Operation *Iraqi Freedom* in 2003. The ISG was tasked with the responsibility of finding Iraq's suspected NBC weapons programmes. The final report is a comprehensive three-volume work, which details the history and development of Iraq's NBC weapons programmes. Deficiencies in primary sources have been redressed by undertaking extensive interviews with relevant policy analysts, government officials, academics and scientific personnel.

One of the major challenges of working with archival material is the issue of selective deposit.<sup>40</sup> There may be substantial pieces of information that may or may not have been recorded and released for public consumption. This is of particular concern regarding personal correspondence between key officials in the decision-making process. Although data from primary sources can often provide a somewhat one-sided

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<sup>39</sup> This is a select and by no means exhaustive list of relevant UNSCOM and IAEA documents. See bibliography for full details. Consolidated report on the first two IAEA inspections under security council resolution 687 (1991) of Iraqi nuclear capabilities, S/22788, 11 July 1991; Report on the third IAEA on-site inspection in Iraq under security Council Resolution 687 (1991), S/22837, 25 July 1991; First consolidated report of the Director General of the International Atomic Energy Agency under paragraph 16 of Security Council resolution 1051 (1996), S/1996/261, 11 April 1996; Fourth consolidated report of the Director General of the International Atomic Energy Agency under paragraph 16 of Security Council resolution 1051 (1996), S/1997/779, 8 October 1997; Report of the Director General of the International Atomic Energy Agency on the Implementation of the Agency's Plan for Future Ongoing Monitoring and Verification of Iraq's Compliance with Paragraph 12 of Resolution 687 (1991), S/23813, 15 April 1992; Sixth Report of the Director General of the International Atomic Energy Agency on the Implementation of the IAEA's Plan for Future Ongoing Monitoring and Verification of Iraq's Compliance with Paragraph 12 of Resolution 687 (1991), S/1994/1151, 10 October 1994; Second Report of the Executive Chairman of UNSCOM, United Nations Security Council Report, S/23268, 4 December 1991; Tenth report of the Executive Chairman of the Special Commission established by the Secretary-General pursuant to paragraph 9 (b)(i) of Security Council resolution 687 (1991), and paragraph 3 of resolution 699 (1991) on the activities of the Special Commission, S/1995/1038, 7 December 1995; Fourth report of the Executive Chairman of the Special Commission established by the Secretary-General pursuant to paragraph 9 (b)(i) of Security Council resolution 687 (1991), on the activities of the Special Commission, S/24844, 17 December 1992.

<sup>40</sup> R. A. Jones, *Research Methods in the Social and Behavioural Sciences* (Sunderland: Sinauer Associates, 1985), 85.



perspective on a phenomenon, when examining the justification for a particular decision taken by a small number of key people, the rationales contained in primary sources, untainted by the interpretation of other scholars, are still vital as they provide this information in the most unrefined form that is available. Indeed, without these sources of data, one would be relegated solely to a mere rehashing of the thoughts of other authors.

### *Analysis of Secondary Literature Sources*

At present, most of the literature deals with either nuclear weapons decisions or CBW decisions. Many experts and academics have chosen to focus their own research interests on one or the other, typically not both. As a result there is a shortage of relevant and current literature dealing with this particular issue. Due to the lack of relevant literature dealing with this topic, I began the process of undertaking a comprehensive literature review in October 2006. Due primarily to the originality of this research project, this literature review was a long, though informative process. Sources authored by Margaret Gowing, Lorna Arnold, John Simpson and Brian Balmer, relating to the development of the British NBC weapons programmes, has proven to be a valuable source of empirical information.<sup>41</sup> Some of the key figures in the analysis of the Iraqi weapons programmes, such as Charles Duelfer, Tim Trevan, Scott Ritter and Rod Barton, have written extensively on the subject as well.<sup>42</sup>

Despite the disadvantages of utilizing this form of data in certain kinds of research initiatives, the analysis and arguments of several leading scholars in the fields of NBC weapons policy must still form an important aspect of the research project.

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<sup>41</sup> The literature on CBW is less rich than that of nuclear weapons with few books dealing specifically with British CBW. Kim Coleman, *A History of Chemical Warfare* (Basingstoke: Palgrave Macmillan, 2005); Brian Balmer, *Britain and Biological Warfare: Expert Advice and Science Policy, 1930-65* (Basingstoke: Palgrave, 2001); Edward M. Spiers, *Chemical Warfare* (London: Macmillan, 1986); Edward M. Spiers, *Chemical Weaponry: A Continuing Challenge* (Basingstoke: Macmillan, 1989). Nuclear weapons history is far more diverse, see Margaret Gowing, *Britain and Atomic Energy: 1939-1945* (London: Macmillan, 1964); Margaret Gowing and Lorna Arnold, *Independence and Deterrence: Britain and Atomic Energy, 1945-1952. Volume I, Policy Making* (London: Macmillan, 1974); Lorna Arnold, *Britain and the H-Bomb* (Basingstoke: Palgrave, 2001); John Simpson, *The Independent Nuclear State: The United States, Britain and the Military Atom* (London: Macmillan, 1983).

<sup>42</sup> Rod Barton, *The Weapons Detective: The Inside Story of Australia's Top Weapons Inspector* (Melbourne: Black Inc. Agenda, 2006); Charles A. Duelfer, *Hide and Seek: The Search for Truth in Iraq* (New York: Public Affairs, 2009); Graham S. Pearson, *The Search for Iraq's Weapons of Mass Destruction: Inspection, Verification and Non-Proliferation* (Basingstoke: Palgrave, 2005); Scott Ritter, *Iraq Confidential: The Untold Story of the Intelligence Conspiracy to Undermine the UN and Overthrow Saddam Hussein* (New York: Nation Books, 2005); Tim Trevan, *Saddam's Secrets: The Hunt for Iraq's Hidden Weapons* (London: Harper Collins, 1999).

Employing secondary literature sources in my analysis serves to both guide my research away from areas that have already been covered in great depth and also to provide alternative explanations against which to judge my hypotheses and conclusions. Moreover, ideas about approaches to studying this topic, gleaned from examining secondary sources, have assisted in shaping the direction of research. Finally, good secondary sources are themselves often based on data from multiple primary sources that could be difficult to obtain, such as personally conducted interviews with key decision-makers. This, combined with the unique nature of this project, ensures that secondary sources are often the only readily available sources for a significant amount of primary information concerning the connections between NBC weapons development and governmental policy decisions.

### *Interviews*

Case studies typically combine data collection methods such as archives, interviews, questionnaires, and observations.<sup>43</sup> Yin believes that interviews are one of the most important sources of case study information.<sup>44</sup> The interview process has proven to be a eminently valuable tool of data collection for both case studies. Interviews are defined here as:

A specialized pattern of verbal interaction – initiated for a specific purpose and focused on some specific content area, with consequent elimination of extraneous material. Moreover, the interview is a pattern of interaction in which the role relationship of interviewer and respondent is highly specialized, its specific characteristics depending somewhat on the purpose and character of the interview.<sup>45</sup>

I interviewed over thirty academics, policy analysts, scientists, government officials and persons of note<sup>46</sup> each providing me with a great deal of insight and analysis on either Iraq or the United Kingdom's NBC weapons programmes.

A comprehensive list of potential interview participants was compiled in the months leading up to the start of the fieldwork process. This list was comprised of approximately 80 individuals located at over 30 different institutions and organizations

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<sup>43</sup> Eisenhardt, "Building Theories from Case Study Research," 534.

<sup>44</sup> Yin, *Case Study Research*, 82.

<sup>45</sup> Robert L. Kahn and Charles F. Cannell, *The Dynamics of Interviewing: Theory, Technique, and Cases* (New York: Wiley, 1957), 16.

<sup>46</sup> A person of note is someone who falls outside of the four aforementioned professional areas, but has a significant amount of insight and knowledge on the relevant topic(s). One such person was Lorna Arnold of Botley, Oxford. Mrs. Arnold was involved in the British nuclear weapons programme as one of two official historians – the other being the late Margaret Gowing.

in Europe, North American and Australia. Creating a comprehensive list or guide can be an important tool as it makes the researcher aware that quite often, valuable respondents become identified only during the course of study, whereas some respondents initially selected might be of little value.<sup>47</sup> Individuals were both added and removed from the list as the interview process evolved, leaving a focused and concise list of potential interview participants.<sup>48</sup>

The interview format was semi-structured, with candidates being selected based primarily on their expertise in the related field. Since I am dealing with different weapons technologies and different case study states, it has been of great benefit to have potential interviewees chosen in this way as opposed to a more stringent pre-selection process as this has allowed candidates identified in the course of formal interviewing to be incorporated into the process as well.<sup>49</sup> Because of the diversity in expertise of interview candidates and the nature of this research project, a non-standardized approach was taken, thereby allowing greater freedom in the interview question/answer process. The main benefit of this type of interviewing process is that:

The interview content can be varied from one respondent to another on the basis of his conceptual grasp of the overall subject matter of the study, each respondent giving the information and the idea that he is best suited to provide. Since, in these circumstances, use of a predetermined, comprehensive set of questions can be only a hindrance, the non-standardized interview does not employ a schedule.<sup>50</sup>

The preferred method of data collection during the interview process has been to digitally record the interviews. I believe that it is the most accurate method of data collection and it is far less likely that information will be taken out of context or misinterpreted due to poor note-taking. Yin believes that recording interviews provides a more accurate rendition of any interview than any other method.<sup>51</sup> In conducting previous research for my Master of Strategic Studies dissertation, titled, *Terrorism and Mass-Casualty Weapons: The Choice of a New Generation?* I interviewed a number of policy analysts, scientists, government officials and military personnel in both Europe and North America. It was my experience that the majority of interviewees were comfortable with having their interview digitally recorded. In fact, voice recorders are

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<sup>47</sup> Stephen A. Richardson, Barbara Snell Dohrenwend and David Klein, *Interviewing: Its Forms and Functions* (New York: Basic, 1965), 65.

<sup>48</sup> For the complete list of Interview Participants see Appendix 3.

<sup>49</sup> Ibid., 54.

<sup>50</sup> Ibid.

<sup>51</sup> Yin, *Case Study Research*, 85.

widely used in journalism and in other forms of research that it can be quite uncommon to have the request to record refused.<sup>52</sup> This has proven to be the case once again, with the lone exception of an individual employed by a national government, legally bound to not be audio recorded. However, it was anticipated that some candidates would not be comfortable with the recording process and therefore an attempt to take comprehensive handwritten notes was made during the interview as per their request.

In regard to the issue of confidentiality, all candidates had the option presented to them to remain completely anonymous. A standardized release form was provided, which informed them of their rights as well as the guarantee of anonymity.<sup>53</sup> While the release forms were appreciated they were deemed superfluous by all of the participants, with a single individual wishing not to be quoted directly.

Interviews typically lasted between 45 and 120 minutes. The majority of interviews were conducted in person with three needing to be done via the telephone as the distances involved were outside the logistical scope of the project. Initial response to interview requests varied between Europe and North America and between organizational areas. Some of the individuals contacted were either unavailable, unsure as to how they could contribute so respectfully declined or were simply unreachable. Since a large number of individuals were identified, it was unavoidable that there would be scheduling conflicts and refusals to participate. Having said that, there were a significant number of high-priority or *elite* interviews<sup>54</sup> that were identified as being of high-value to the project and all of these individuals were interviewed successfully.

### *Elite Interviews*

An elite interview is any interviewee who in terms of the current purposes of the interviewer is given special, non-standardized treatment.<sup>55</sup> Lewis Dexter defines non-standardized treatment as:

Stressing the interviewee's definition of the situation; Encouraging the interviewee to structure the account of the situation and; Letting the interviewee introduce to a considerable extent – and extent which will of course vary from project to project and interviewer to interviewer – his

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<sup>52</sup> Jack D. Douglas, *Creative Interviewing* (Beverly Hills: Sage, 1985), 83.

<sup>53</sup> See Appendix 4 for a reproduction of the interview release form.

<sup>54</sup> The number of elite interviews was twelve.

<sup>55</sup> Lewis Anthony Dexter, *Elite and Specialized Interviewing* (Evanston: Northwestern University Press, 1970), 5.

notions of what he regards as relevant, instead of relying upon the investigator's notions of relevance.<sup>56</sup>

Some of the individuals interviewed have a long and extensive history in dealing with aspects of one of the two case studies. These individuals were singled out as high-priority targets and every effort was made to ensure their participation in the interview process.

According to Tansey, "One of the strongest advantages of elite interviews is that they enable researchers to interview first-hand participants of the processes under investigation, allowing for researchers to obtain accounts from direct witnesses to the events in question."<sup>57</sup> He also states:

The usage that is arguably most relevant to process tracing entails the conduct of elite interviews in order to establish the decisions and actions that lay behind an event or series of events. Through direct and focused questioning, researchers can reconstruct political episodes on the basis of the testimony of respondents, stitching together various accounts to form a broader picture of a complex phenomenon, and gather detailed information about the process in question. Elite interviews can shed light on the hidden elements of political action that are not clear from analysis of political outcomes, or of other primary sources. By interviewing key participants in the political process, analysts can gain data about the political debates and deliberations that preceded decision-making and action taking, and supplement official accounts with first-hand testimony.<sup>58</sup>

This is especially relevant for the study of Iraq's proscribed weapons programmes of the 1980s and 90s.

Fortunately I was able to meet with a number of scientists and government officials who had been actively involved in UN activities in Iraq after the 1990 invasion of Kuwait and the 1991 Gulf War. These individuals witnessed first-hand the concealment and covering-up of the proscribed weapons programmes and were involved in the attempts to counter the deception campaign. Since the UK case study is firmly rooted in the immediate post Second World War period, there are few people left who would have been involved in the programmes in any capacity in, with the exception of Gradon Carter of Defence Science and Technology Laboratory (DSTL) Porton Down, Ron Manley formerly of Chemical Defence Establishment (CDE)<sup>59</sup>

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<sup>56</sup> Ibid.

<sup>57</sup> Tansey, "Process Tracing and Elite Interviewing," 767.

<sup>58</sup> Ibid., 766-767.

<sup>59</sup> It should be noted that Dr. Manley joined CDE in 1960, after the offensive programme had been abandoned. Interview with Ron Manley, 29 August 2009.

Nancekuke and Lorna Arnold. These individuals provided me with a first-hand account that would have been difficult to acquire otherwise.

Other advantages of elite interviews relate to the particular weaknesses of archival documents, as interviews can compensate for both the shortfall and limitations of documentary evidence. The data from elite interviews are rarely considered in isolation, and the goal of collecting such data is often to confirm information that has already been collected from other sources. Tansey argues that, “interviewing, and especially elite interviewing, is highly relevant for process-tracing approaches to case study research as process tracing frequently involves the analysis of political developments at the highest level of government, and elite actors will thus often be critical sources of information about the political processes of interest.”<sup>60</sup>

### *Fieldwork*

The course of action decided upon in regard to fieldwork, was to focus on one case study at a time – to gather all the data necessary for the analysis then move on to the next case. Fieldwork for the Iraq study took place at the end of March 2008, lasting 15 days. During this trip I met with a number of individuals familiar with Iraq’s proscribed weapons programmes. Many of these individuals were key players in the United Nations’ effort to verify disarmament and to monitor Iraqi compliance. Along with an exhaustive study of the *Iraq Survey Group* report on Iraq’s proscribed weapons programmes as well as the UNMOVIC Compendium – two key documents necessary for any analysis of Iraq’s NBC weapons programmes – the interviews provided valuable insight into the decision-making process in the former regime. What has emerged from the work has been an insightful look into the decision-making processes of a complex and ultra-violent authoritarian regime.

The fieldwork for the British case study occurred entirely within the United Kingdom. A number of short trips were made to various archives, universities, government ministries and research establishments throughout the late summer and autumn of 2008. One month was spent researching at TNA. As TNA is located a moderate distance away, travel to and from Kew was never an issue, which made the

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<sup>60</sup> Tansey, “Process Tracing and Elite Interviewing,” 766-767.

data collection process run smoothly. A number of interviews were conducted in addition to the primary documentary evidence gathered. These interviews helped fill in some of the gaps in knowledge that existed and also provided context to the primary data.

I had anticipated having some difficulty in establishing contact with some of the more senior people who dealt with Iraq via the United Nations or IAEA in Vienna. Fortunately, this proved to not be the case. I have interviewed a number of high-level diplomats, scientists, analysts and government officials, all intimately familiar with Iraq. The response was positive. This was also the case for the British study, as it was more of a challenge to establish contact with individuals familiar with the British nuclear weapons programme as opposed to the CBW programmes. The Mountbatten Centre for International Studies at the University of Southampton proved to be an invaluable resource in helping identify contacts in the nuclear field.

### *Summary*

Methodology is an important aspect of any doctoral research project and choosing one that is appropriate is critical to the overall success of the research project. Evidence has been provided for the justification of employing a case study methodology as well as using Iraq and the United Kingdom as the two historical cases. The argument for using polar type case studies is that they provide the strongest and most relevant data possible. Being unable to generalize from one case to another is a common criticism of case study research. Yin believes that the solution to this is, “instead of trying to generalize findings to other cases, the researcher should be aiming to generalize their findings to theory, similar to how a scientist would generalize from experimental findings to theory.”<sup>61</sup> This is an important point, as the intention is to use the two cases to try and determine *how* and *why* states make decisions to develop NBC weapons. Synthesizing the lessons learned from the UK and Iraq case studies will help to form a framework for understanding connections between NW and CBW. Since my research has often gleaned useful and relevant data that lies beyond the boundaries of the chosen case studies, this will also be elaborated upon in the concluding chapter on interconnections.

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<sup>61</sup> Yin, *Case Study Research*, 39-40.

A final note about methodology – while it provides a good base for “conducting operations,” a suitable theoretical approach must be in place to help drive the research forward. Without theory as a guide, research questions can end up being too broadly based and ill defined, with the potential to create an unfocused end product. The methods eventually chosen for this research project proved satisfactory.



### CHAPTER 3

#### THE UNITED KINGDOM

It will be a cardinal principle of policy to be prepared to use immediately weapons of mass destruction. The knowledge of this preparedness is the best deterrent to war in peace-time.<sup>1</sup>

- UK Chiefs of Staff, 23 April 1947

During the first half of the twentieth century the British Empire spread across roughly one-quarter of the earth's surface and encompassed over 400 million people, with interests on every continent. It was accepted that some of its colonial territories would be resistant to British Imperial rule and would desire more autonomy and greater independence from London. In October 1899, hostilities erupted between the British and the two-predominately Afrikaans republics of Orange Free State and the South African Republic (Transvaal) and lasted for three years.<sup>2</sup> While the Second South African War was far from the most influential event of the twentieth century, it highlighted the existence of a significant strategic and tactical learning curve that influenced how future military conflicts would be conducted.

A few months prior to the outbreak of hostilities in South Africa, the meetings for the First Peace Conference of The Hague took place from 18 May to 29 July. This conference was convened on the initiative of Tsar Nicholas II of Russia for the purpose of, "seeking the most effective means of ensuring to all peoples the benefits of a real and lasting peace, and, above all, of limiting the progressive development of existing armaments."<sup>3</sup> In total twenty-six states were represented, including the USA, UK, Russia, Germany, Japan and France. The subsequent convention, which entered into force on 4 September 1900, consisted of four main sections along with three declarations. Of special note was Declaration II, titled, "On the Use of Projectiles the Object of Which is the Diffusion of Asphyxiating or Deleterious Gases," which read:

The undersigned, Plenipotentiaries of the Powers represented at the International Peace Conference at The Hague, duly authorized to that

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<sup>1</sup> Defence Research Policy Committee, Final Version of a Paper on Future of Defence Research Policy, 30 July 1947. TNA DEFE 10/19.

<sup>2</sup> The war officially ended on 31 May 1902 with the signing of the Treaty of Vereeniging. See Thomas Pakenham, *The Boer War* (London: Abacus, 1991).

<sup>3</sup> "International Humanitarian Law – Treaties & Documents – Final Act Of the International Peace Conference, The Hague, 29 July 1899." (Russian note of 30 December 1898/11 January 1899). International Committee of the Red Cross, accessed 30 October 2009, <http://www.icrc.org/ihl.nsf/FULL/145?OpenDocument>.

effect by their Governments, inspired by the sentiments which found expression in the Declaration of St. Petersburg of 29 November (11 December) 1868, Declare as follows: The Contracting Powers agree to abstain from the use of projectiles the sole object of which is the diffusion of asphyxiating or deleterious gases. The present Declaration is only binding on the Contracting Powers in the case of a war between two or more of them. It shall cease to be binding from the time when, in a war between the Contracting Powers, one of the belligerents shall be joined by a non-Contracting Power. The present Declaration shall be ratified as soon as possible. The ratifications shall be deposited at The Hague. A 'procès-verbal' shall be drawn up on the receipt of each ratification, a copy of which, duly certified, shall be sent through the diplomatic channel to all the Contracting Powers. The non-Signatory Powers can adhere to the present Declaration. For this purpose they must make their adhesion known to the Contracting Powers by means of a written notification addressed to the Netherlands Government, and by it communicated to all the other Contracting Powers. In the event of one of the High Contracting Parties denouncing the present Declaration, such denunciation shall not take effect until a year after the notification made in writing to the Government of the Netherlands, and forthwith communicated by it to all the other Contracting Powers. This denunciation shall only affect the notifying Power. In faith of which the Plenipotentiaries have signed the present Declaration, and affixed their seals thereto. Done at The Hague, 29 July 1899, in a single copy, which shall be kept in the archives of the Netherlands Government, and copies of which, duly certified, shall be sent by the diplomatic channel to the Contracting Powers.<sup>4</sup>

The Russian proposal stemmed from their realization that “in order to sufficiently rearm their military to the level of their adversaries would effectively bankrupt the treasury as opposed to the pure humanitarian construct of multilateral disarmament.”<sup>5</sup> According to Catherine Jefferson, “While the conference achieved nothing in terms of disarmament in the literal sense, delegates did endeavour to revise the customary laws of war (revisiting the draft code prepared at the Brussels Convention of 1874) and to consider the question of unnecessary suffering with respect of newly invented weapons.”<sup>6</sup> The First Hague Conference attempted to establish a norm against causing unnecessary suffering in war. Fifteen years later, large-scale chemical warfare would be unleashed on battlefields across Europe.

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<sup>4</sup> “International Humanitarian Law - Treaties & Documents - Declaration (IV, 2) concerning Asphyxiating Gases, The Hague, 29 July 1899. “International Committee of the Red Cross, accessed 14 September 2009, <http://www.icrc.org/ihl.nsf/WebART/165-140001?OpenDocument>.

<sup>5</sup> Thomas K. Ford, “The Genesis of the First Hague Peace Conference,” *Political Science Quarterly*, Volume 51, Number 3 (September 1936): 380.

<sup>6</sup> Catherine Jefferson, “The Taboo of Chemical and Biological Weapons: Nature, Norms and International Law” (DPhil diss., University of Sussex, 2009), 80-81.

Twelve years after the end of the conflict in South Africa, the United Kingdom would find itself embroiled in a terribly destructive war alongside its dominions, colonies, France, Russia, Serbia, Belgium, Italy, Romania and from 1917 the United States; against the Central Powers of the German, Austro-Hungarian and Ottoman Empires along with newly-independent<sup>7</sup> Bulgaria. From August 1914 millions of men fought and died in the fields of Europe, Asia Minor and the Middle East. By November 1918, roughly ten million soldiers had died and over twice as many had received varying levels of injury from a multitude of both old and new weaponry. Aircraft, armoured tanks, submachine guns, flamethrowers and chemical weapons all saw their introduction into the arsenals of the combatants during this period.<sup>8</sup>

Prior to the outbreak of the First World War, according to Stephen Van Evera, “Military glorified the offensive and adopted offensive military doctrines, while civilian elites and publics assumed that the offense had the advantage in warfare, and that offensive solutions to security problems were the most effective.”<sup>9</sup> All major European armies prior to the outbreak of war in 1914 subscribed to this “cult of the offensive.”<sup>10</sup> By 1917, both sides were quick to try new ideas in hopes of breaking the stalemate that developed. Gone was the belief in offensive infantry attacks and the efficacy of a cavalry charge. This replaced with a combined arms approach to offensive tactics as well as the appalling concept of attritional warfare.<sup>11</sup>

The lessons of this war were such that it impressed upon the military and political leadership of the United Kingdom the need for rapid technological change. New strategies and tactics were formed with the advent of these new weapons technologies. Defence would play a bigger role than it ever had previously. Above all, people started to realize that in order to be ultimately successful in battle, you needed to

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<sup>7</sup> Bulgaria proclaimed itself a fully independent state on 5 October 1908. This is perhaps a bit confusing as the 5 October declaration was according to the Gregorian calendar, even though Bulgaria did not formally adopt the Gregorian calendar until 1915. The date under the Julian calendar was 22 September. Richard J. Crampton, *Bulgaria, 1878-1918: A History* (Boulder: East European Monographs, 1983), 314.

<sup>8</sup> Martin van Creveld, *Technology and War: From 2000 BC to the Present* (New York: Free Press, 1989), 177; Tim Travers, *How the War Was Won: Factors that Led to Victory in World War One* (Barnsley: Pen & Sword Military Classics, 2005), 35-36.

<sup>9</sup> Steven Van Evera, “The Cult of the Offensive and the Origins of the First World War,” *International Security*, Volume 9, Number 1 (Summer 1984): 58.

<sup>10</sup> Tim Travers, *The Killing Ground: The British Army, The Western Front and the Emergence of Modern Warfare, 1900-1918* (London: Unwin Hyman, 1987), 38; Jack Snyder, “Civil-Military Relations and the Cult of the Offensive,” *International Security*, Volume 9, Number 1 (Summer 1984): 109-110; Van Evera, “The Cult of the Offensive and the Origins of the First World War,” 58-61.

<sup>11</sup> See Gordon Corrigan, *Mud, Blood and Poppycock: Britain and the First World War* (London: Cassell, 2008) and Shelford Bidwell and Dominick Graham, *Fire Power: The British Army – Weapons and Theories of War, 1904-1945* (Barnsley: Pen & Sword Military Classics, 2004).

provide your troops with every available means to assist them in achieving their overall objectives. Unfortunately this meant that interest in non-conventional weapons would in due course become paramount to Britain's understandings of offence, defence and the concept of deterrence.

### THE CHEMICAL WEAPONS PROGRAMME

British opinions on chemical warfare were influenced by events occurring during the First World War. This conflict saw the first large-scale uses of toxic chemicals as weapons, which began in early 1915. On 10 March, approximately 6000 chlorine gas cylinders were put in position in front of the trenches of Germany's XV Corps.<sup>12</sup> Five weeks later, after countless delays due to specific meteorological concerns, at 17:00 hours on 22 April, elements of Pioneer Regiments 35 and 36 of XV Corps tasked with the job of releasing the deadly gas did so to great effect. As the green-yellow cloud of chlorine drifted towards the Allied lines, many believed that it was merely a new type of gunpowder that the Germans were experimenting with.<sup>13</sup> This was not the case. The hardest hit were the 45<sup>th</sup> Algerian (Colonial) and 87<sup>th</sup> French Territorial Divisions, which was to the left of the Canadian 2<sup>nd</sup> and 3<sup>rd</sup> Brigades of the 1<sup>st</sup> Canadian Division. Amidst the confusion, casualties and retreating soldiers, the Germans managed to force a mile-long gap in the front lines.<sup>14</sup> This posed immediate problems for the 50 000 British and Canadian troops of the British Second Army that were situated directly to the right of the gap. If the line could not be reformed and held the Germans would have had an open road to Calais, as nothing lay between them and Calais but the Canadians. Fortunately elements of the 1<sup>st</sup> Canadian Division – namely 7, 10, 14 and 16 Battalions were called up to stem the German advance and hold the line vacated by the rapidly retreating French.

In total, 168 tons of chlorine gas from 5730 canisters was released on 22 April.<sup>15</sup> Allied losses were substantial. The Canadians suffered 637 gas-related casualties while the French put their losses at about 600. Unfortunately for the men at the front, there would be no respite from the horrors of gas attacks. At 04:00 hours on 24 April another

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<sup>12</sup> Tim Cook, *No Place to Run: The Canadian Corps and Gas Warfare in the First World War* (Vancouver: UBC Press, 1999), 19.

<sup>13</sup> Ibid.

<sup>14</sup> J. E. Edmonds and G. C. Wynne, *Official History of the Great War, Military Operations: France and Belgium, 1915, Volume I* (London: Macmillan, 1927), 180.

<sup>15</sup> Augustin M. Prentiss, *Chemicals in War: A Treatise on Chemical Warfare* (New York: McGraw-Hill, 1937), 663.

gas attack was launched after a whirlwind German bombardment of the Allied front lines. This time 8 and 15 Canadian Battalions bore the brunt of the chlorine attack. Fighting over the next few days was fierce and when the beleaguered 1<sup>st</sup> Division was finally relieved it had lost over half of its fighting strength with 6036 casualties, though not all from the effects of CW.<sup>16</sup>

While the bulk of the British 2<sup>nd</sup> Army was spared the horror of gas warfare, the lessons of Gravenstafel Ridge and St. Julien were not lost on their commanders. On 3 May, Secretary of State for War, Lord Kitchener authorized the preparation of measures to retaliate against the German use of poison gas.<sup>17</sup> That July saw the formation of Special Companies Nos. 186 and 187 of the British Special Brigade, under Major Charles H. Foulkes of the Royal Engineers, totalling 670 men.<sup>18</sup> A month later, Special Companies Nos. 188 and 189 were formed. The Special Companies were comprised of volunteer chemists and chemistry students and they were responsible for preparing the British chemical retaliation against German troops. Organization of the companies continued throughout the summer. On 4 September, eighteen Sections (No. 186) of men were assigned to the First Army, I Corps, and another sixteen Sections (No. 187) went to IV Corps, totalling thirty-four Sections.<sup>19</sup> The Special Companies were eventually reorganized in 1916 into the Special Brigade, which consisted of four full-sized battalions (1, 2, 3, 4 Battalions) of four companies, each with twenty four sections, plus 5 Mortar Battalion, which had four companies and sixteen sections.<sup>20</sup>

On 24 September 1915, the British launched their first chemical weapons attack of the war. Approximately 5500 canisters containing 150 tons of chlorine were used against German troops during the Battle of Loos.<sup>21</sup> There were a number of logistical and communications problems that prevented the attack from being a successful one. In fact, British gas casualties were high – 2639 and the Special Companies had lost 14% of their total strength, including twenty-two dead.<sup>22</sup>

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<sup>16</sup> Cook, *No Place to Run*, 30.

<sup>17</sup> C. H. Foulkes, *Gas! The Story of the Special Brigade* (London: William Blackwood & Sons, 1936), 36.

<sup>18</sup> J. E. Edmonds and G. C. Wynne, *Official History of the Great War, Military Operations: France and Belgium, 1915, Volume 2* (London: Macmillan, 1928), 151.

<sup>19</sup> Foulkes, *Gas! The Story of the Special Brigade*, 62-63.

<sup>20</sup> Donald Richter, *Chemical Soldiers: British Gas Warfare in World War I* (Lawrence: University Press of Kansas, 1992), Appendix A: Structural Chart, 235.

<sup>21</sup> Albert Palazzo, *Seeking Victory on the Western Front: The British Army & Chemical Warfare in World War I* (Lincoln: University of Nebraska Press, 2000), 63.

<sup>22</sup> Richter, *Chemical Soldiers*, 61.

According to L. F. Haber, “The British initiative came from the Admiralty where Churchill’s imagination was fired by hydrogen cyanide.”<sup>23</sup> This interest would lead to the creation of what was referred to as Jellite. This consisted of an aqueous hydrogen cyanide solution thickened with chloroform and cellulose acetate dope.<sup>24</sup> On 13 September, the first batch of Jellite was produced and ten days later, 120 jars, each weighing fifteen kilograms was sent to Boulogne, France.<sup>25</sup> This was never used and was ultimately returned to the production facility at Stratford. Throughout 1916 and into 1917, both Britain and France employed another hydrogen cyanide solution in artillery shells. Called Vincennite after the French factory at Vincennes, this compound proved to be largely ineffective as an artillery shell, especially in light of the efficacy of phosgene as a chemical weapon.<sup>26</sup> By the end of 1916, approximately 160 000 British artillery shells were filled with the solution though the shells were never fired.<sup>27</sup> The French however, used Vincennite for the first time at the opening of the Battle of the Somme on 1 July 1916.<sup>28</sup>

Phosgene, like chlorine, is a non-persistent lung irritant or choking agent that killed by destroying lung tissue in an affected person. First used by the Germans against the British at Nieltje in Flanders, phosgene was the deadliest of all gases used during the First World War as it accounted for roughly 80% of all gas-related fatalities.<sup>29</sup>

The German first-use of mustard on 12 July 1917 near Ypres was of particular significance, as, according to Augustin Prentiss, it “marked the beginning of a new phase of gas warfare.”<sup>30</sup> Mustard is a persistent blister agent or vesicant. It was the pre-eminent chemical weapon used during the First World War, as it was responsible for causing the highest number of gas-related casualties though a relatively small percentage of men contaminated with mustard died.<sup>31</sup> As Prentiss explains:

With its far-reaching diffusion over the battlefields, its insidious action, and its manifold physiological effects, it is no wonder that mustard gas

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<sup>23</sup> L. F. Haber, *The Poisonous Cloud: Chemical Warfare in the First World War* (Oxford: Clarendon Press, 1986), 63.

<sup>24</sup> Ibid.

<sup>25</sup> Ibid.

<sup>26</sup> Foulkes, *Gas! The Story of the Special Brigade*, 106-107.

<sup>27</sup> J. E. Edmonds, *Official History of the Great War, Military Operations: France and Belgium, 1916, Volume I* (London: Macmillan, 1932), 80.

<sup>28</sup> Prentiss, *Chemicals in War*, 172.

<sup>29</sup> In this attack phosgene was mixed with chlorine. Prentiss, *Chemicals in War*, 154-155.

<sup>30</sup> Ibid., 178-79.

<sup>31</sup> J. B. S. Haldane explains that mustard gas caused 150 000 casualties within the British Army though less than 4000 of those exposed, or 1 in 40 had died. J. B. S. Haldane, *Callinicus: A Defence of Chemical Warfare* (New York: E. P. Dutton, 1925), 26.

became the “king of battle gases” and, pound for pound, produced nearly eight times the number of casualties produced by all the other battle gases combined.<sup>32</sup>

Exposure to mustard gas would typically result in blisters, blindness and respiratory damage and in cases of substantial exposure, central nervous excitations, convulsions and death.<sup>33</sup> However, it was not until August 1918 when the UK was finally able to manufacture, weaponize and deploy a made-in-Britain mustard, three months before the November Armistice ending the war.

### *The Interwar Years*

The interwar period saw a number of changes in British CW policy. In early 1919, the British government had decided on major cutbacks in the production of chemical weapons.<sup>34</sup> During this time, destruction and decontamination of British and French-based CW dumps continued, ending in 1921. The first major British use of chemical weapons post-First World War occurred between 27 August and 4 September 1919.<sup>35</sup> British forces had conducted eight separate attacks using the “M” device during the Allied intervention in the Russian Civil War.<sup>36</sup> This device generated toxic smoke by heating an arsenic derivative, Adamsite. In total, 361 bombs were dropped during the conflict.<sup>37</sup> Later that year, on 16 October, in a reversal of policy, the British War Cabinet decided to retain its wartime gas organization stating that, “no other military Power had taken the initiative in chemical disarmament.”<sup>38</sup> One year later, the League of Nations Permanent Advisory Commission on Military and Naval Technical Questions decided that, “it would be useless to seek to restrict the use of gases in War time by prohibiting or limiting their manufacture in peace time.”<sup>39</sup> This declaration prompted the British government to increase funding for chemical warfare from £52

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<sup>32</sup> Prentiss, *Chemicals in War*, 188.

<sup>33</sup> World Health Organization, *Public Health Response to Biological and Chemical Weapons* (Geneva: World Health Organization, 2004), 164-165.

<sup>34</sup> G. B. Carter and Graham S. Pearson, “Past British Chemical Warfare Capabilities,” *RUSI Journal* (February 1996): 59.

<sup>35</sup> Robert Jackson, *At War with the Bolsheviks: The Allied Intervention into Russia, 1917-20* (London: Tom Stacy, 1972).

<sup>36</sup> Edward M. Spiers, *Chemical Weaponry: A Continuing Challenge* (Basingstoke: Macmillan, 1989), 83-84.

<sup>37</sup> Reply to G.O.C’s Instructions Ordering Definite Report on Effects of Smoke Generators “M” Type During Operations on Railway Front, 17 September 1919. TNA WO 106/1170.

<sup>38</sup> War Cabinet, Meeting Minutes, 16 October 1919. TNA CAB 23/12.

<sup>39</sup> Summary of Important Notes and Papers in connection with the policy of gas warfare in order of dates from 1899. League of Nations, Opinion of Commission – CP 2177, 22 October 1920. TNA WO 188/212.

000 in 1920-21 and £135 130 in 1921-22.<sup>40</sup> Hereafter the British chemical warfare effort would focus on the retention of its wartime organizational structure as well as its R&D efforts.

The year 1925 would see the international agreement on the Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or other Gases, and of Bacteriological Methods of Warfare. Signed on 17 June 1925 in Geneva, the Protocol reads:

Whereas the use in war of asphyxiating, poisonous or other gases, and of all analogous liquids materials or devices, has been justly condemned by the general opinion of the civilized world; and

Whereas the prohibition of such use has been declared in Treaties to which the majority of Powers of the world are Parties; and

To the end that this prohibition shall be universally accepted as a part of International Law, binding alike the conscience and the practice of nations;

Declare:

That the High Contracting Parties, so far as they are not already Parties to Treaties prohibiting such use, accept this prohibition, agree to extend this prohibition to the use of bacteriological methods of warfare and agree to be bound as between themselves according to the terms of this declaration.

The High Contracting Parties will exert every effort to induce other States to accede to the present Protocol. Such accession will be notified to the Government of the French Republic, and by the latter to all Signatory and Acceding Powers, and will take effect on the date of the notification by the Government of the French Republic.

The present Protocol of which the French and English texts are both authentic, shall be ratified as soon as possible. It shall bear today's date.

The ratifications of the present Protocol shall be addressed to the Government of the French Republic, which will at once notify the deposit of such ratification to each of the Signatory and Acceding Powers. The instruments of ratification and accession to the present Protocol will remain deposited in the archives of the Government of the French Republic. The present Protocol will come into force for each Signatory Power as from the date of deposit of its ratification, and, from that moment, each Power will be bound as regards other Powers which have already deposited their ratifications.<sup>41</sup>

The 1925 conference in Geneva was originally intended to restrict or prohibit the international arms trade. This however morphed into an effort to attempt to codify the

<sup>40</sup> Second Report of the Secretary of the Chemical Warfare Committee – Report for the Year Ending 31 March 1922, 6-7. TNA WO 33/1014.

<sup>41</sup> “International Humanitarian Law - Protocol for the Prohibition of the Use of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare, Geneva, 17 June 1925.” International Committee of the Red Cross, accessed 8 November 2009, <http://www.icrc.org/ihl.nsf/52d68d14de6160e0c12563da005fdb1b/626de49e3227d36dc125641e003a172>.



condemnation of chemical warfare and, to lay down definite rules as to its application.<sup>42</sup> The resulting document outlawed the use of chemical and bacteriological weapons, however the final Protocol did not contain any provisions for enforcing the norm against CBW.<sup>43</sup> On 9 April 1930, the UK ratified the Protocol, following a handful of other states including Germany and France.<sup>44</sup>

British policy towards chemical warfare at this time was primarily defensive in nature in terms of both research and training.<sup>45</sup> This was slowly changing and as D. J. C. Wiseman stated:

Service schools and commands should study the offensive employment of gas, not only because the study of offensive gas was necessary for the study of protection against it, but also in order that we might be in a position to retaliate immediately, should this course be forced upon us by our opposition.<sup>46</sup>

As Paul Harris explains, “For various reasons, notably lack of money, few serious preparations for chemical warfare were made until the beginning of the rearmament programme in 1936.”<sup>47</sup> That November, the Committee of Imperial Defence approved requests of the Chiefs of Staff for the manufacture and storage of mustard gas.<sup>48</sup> Cabinet approval was eventually received two years later. In November 1938, Cabinet authorized the completion of a mustard gas production facility at Randle on Merseyside, with a projected scale of 300 tons of mustard per week and a reserve of 2000 tons.<sup>49</sup> By September 1939, British stockpiles of gas were limited, consisting of 500 tons of mustard with a manufacturing capacity of 90 tons per week and 5 tons of bromobenzyl cyanide (BBC) with a manufacturing capacity of 5 tons per week.<sup>50</sup> According to Carter and Pearson, “By October 1939 the War Cabinet approved service proposals to increase chemical warfare agent and weapons production” with the construction of new factories

<sup>42</sup> See Rodney J. McElroy, “The Geneva Protocol of 1925,” in *The Politics of Arms Control Treaty Ratification*, ed. M. Krepon and D. Caldwell. (New York: St Martin's Press, 1991), 125-166.

<sup>43</sup> Jefferson, “The Taboo of Chemical and Biological Weapons,” 109.

<sup>44</sup> “International Humanitarian Law - Protocol for the Prohibition of the Use of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare, Geneva, 17 June 1925, States Parties.” International Committee of the Red Cross, accessed 8 November 2009, <http://www.icrc.org/ihl.nsf/WebSign?ReadForm&id=280&ps=P> ().

<sup>45</sup> D. J. C. Wiseman, *Special Weapons and Types of Warfare: Volume I – Gas Warfare* (London: The War Office, 1951), 1.

<sup>46</sup> *Ibid.*, 2.

<sup>47</sup> Paul Harris, “British Preparations for Offensive Chemical Warfare: 1935-39,” *The RUSI Journal*, Volume 125, Number 2 (1980): 57.

<sup>48</sup> Development of Gas Weapons and Apparatus for Offensive purposes. Minute Sheet No. 45, 3 November 1936. TNA WO 32/3663.

<sup>49</sup> Treasury Inter-Services Committee, Minutes of 175<sup>th</sup> Meeting, 21 October 1938. TNA T 161/1327.

<sup>50</sup> Offensive Chemical Warfare, Note prepared by the Deputy Chief of the Imperial General Staff, 23 September 1939. TNA WO 193/714.

“to meet the targets.”<sup>51</sup> While stockpiles of CW gradually increased, by September 1940, production capacity had not yet reached the level authorized by the War Cabinet the previous year.<sup>52</sup>

### *The Second World War and Postwar Period*

When war came to Europe in 1939 a new and deadly type of chemical weapon was emerging. In late 1936, Dr. Gerhard Schrader of *IG Farbenindustrie* had synthesized a new organic compound by incorporating cyanide with a phosphorus compound. This new organophosphate proved to be highly toxic to warm-blooded animals leading *IG Farben* to inform the German government of its properties.<sup>53</sup> Originally called Preparation 9/91 and renamed Le-100, this compound would become known as tabun (GA). Sarin (GB) was created in 1938, followed by soman (GD) in 1944. Along with cyclosarin (GF), these G-agents were designed primarily to act via inhalation, but also through the skin. Nerve agents affect the transmission of nerve impulses in the nervous system through the, “inhibition of tissue cholinesterases at synaptic sites, and to an accumulation of excessive amounts of acetylcholine at nicotinic and muscarinic receptors in effector organs.”<sup>54</sup>

British chemical weapons at this time consisted primarily of First World War mustard and phosgene. Chemical weapons did not play a big part in the British government’s overall strategic decision-making, although there were plans in place that called for the saturation of south coast beaches in the event of a German amphibious landing.<sup>55</sup> Production and stockpiling continued throughout the war and by 6 June 1944, at the commencement of Operation *Overlord*, the chemical weapons stockpile consisted of 7700 tons of mustard, 111 tons of BBC and a production capacity of 900 tons/month for mustard, 400 tons/month of phosgene and 110 tons/month of BBC.<sup>56</sup> Between 1929 and 1945 a total of 40 719 tons of mustard had been produced, with most of it being weaponized, as well as 14 042 tons of phosgene and tear gas.<sup>57</sup>

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<sup>51</sup> Carter and Pearson, “Past British Chemical Warfare Capabilities,” 61.

<sup>52</sup> Chemical Warfare, Report, COS (40)790, 2 October 1940. TNA WO 193/714.

<sup>53</sup> Stockholm International Peace Research Institute, *The Problem of Chemical and Biological Warfare: The Rise of CB Weapons, Volume I* (Stockholm: Almqvist & Wiksell, 1971), 71.

<sup>54</sup> World Health Organization, *Public Health Response to Biological and Chemical Weapons*, 173.

<sup>55</sup> Air Ministry File, No. HF/S.12237/1/AIR, Contamination of Beaches by Gas Bombing as an Anti-invasion Measure, 1 November 1941. TNA AIR 2/5200.

<sup>56</sup> Wiseman, *Special Weapons and Types of Warfare*, Appendix III – Stock Position – Chemical Weapons and Gas, D-day, 1944, 252.

<sup>57</sup> *Ibid.*, 254.

During the Second World War the use of chemical weapons was given serious thought.<sup>58</sup> In a secret memorandum from the Air Ministry dated 22 June 1940:

In the event of invasion we should use any means at our disposal to repel the enemy, including gas, if this weapon should prove valuable for the purpose. The employment of gas in such circumstances might require the sanction of the War Cabinet in view of our International undertaking not to use gas unless it is first used against us.<sup>59</sup>

The plan was to saturate possible coastal landing points with mustard with the belief that, “it will compel the enemy to wear gas masks and anti-gas clothing and this will have a serious hampering and exhausting effect on his troops at a time when speed and energy will be vital.”<sup>60</sup> While the use of mustard was not going to prevent an amphibious landing, it was however, thought that by slowing down the disembarking troops, it would give the coastal defence units more time to organize and mount an effective defense of the region. There were two scenarios where the employment of gas was considered – in an attempt to invade Britain and against the civil population, without invasion.<sup>61</sup> In a memo to General Ismay, Churchill supported the possibility of using chemical weapons against Germany. He says, “I quite agree that it may be several weeks or even months before I shall ask you to drench Germany with poison gas, and if we do it, let us do it one hundred per cent.”<sup>62</sup> Churchill felt strongly about Britain needing to possess weapons capable of deterring or responding to a potential German CBW attack or amphibious landing on British soil.<sup>63</sup>

After the war the threat shifted eastward toward the Soviet Union where it was suspected that the Soviets were involved in R&D of biological and chemical warfare agents. A Joint Intelligence Committee Report from 1947 states:

Although we have no evidence on which to base a reliable estimate of when the Soviet Union may be ready to use biological weapons on a big

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<sup>58</sup> Provision of Gas Weapons in the Far East, Note by D.O.O. TNA AIR 2/5200; War Cabinet, Chiefs of Staff Committee, Chemical Warfare Report, COS(42)96(0), 13 April 1942. TNA PREM 3/88/2.

<sup>59</sup> Appreciation of the Employment of Gas from the Air in the Event of an Invasion of this Country, 22 June 1940. TNA AIR/5117.

<sup>60</sup> The objective of Plan Y was, “to produce, at all points where store could be landed, a concentration of mustard gas in sufficient quantity to dislocate the enemy’s maintenance programme” TNA AIR 2/5200, Air Ministry File No.HF/S.12237/1/AIR, Contamination of Beaches by Gas Bombing as an Anti-Invasion Measure: Appreciation of the Employment of Gas from the Air in the Event of an Invasion of this Country, 22 June 1940. TNA AIR/5117.

<sup>61</sup> Secret memo from Air Commodore Charles Medhurst to the Air Officer Commanding-in-Chief, Headquarters, Bomber Command, 19 January 1941. TNA AIR 2/5117.

<sup>62</sup> Prime Minister’s Personal Minute to General Ismay for COS Committee, Serial No.D.217/4, 6 July 1944. TNA CAB 120/775.

<sup>63</sup> Prime Minister’s Personal Minute to General Ismay, Serial No.6 68/4, 21 May 1944. TNA CAB 120/782.

scale, it seems probable that her production can be equal to, or greater than, that of any other Power by 1951. Furthermore, the slower her own estimated rate of production of atomic bombs, the more likely is she to seek to hasten her preparedness for using biological weapons.<sup>64</sup>

In terms of chemical warfare the Report states that:

The Russians are likely to be as well prepared to wage chemical warfare, both in offence and in defence as any other Power, after 1948. Until then, the Western Allies will hold the advantage of possessing considerable stocks of the German nerve gas, Tabun, but will not yet have begun production of this or of the more toxic nerve gases. By contrast the Soviet Government could, if this were their policy, produce and build up stocks of Tabun after 1948, or of the other two more toxic types, Soman and Sarin, after 1951.<sup>65</sup>

In fact, the Soviets had acquired some German CW technology in the closing stages of the war. On 5 February 1945, three days prior to the launch of the Silesian Offensives, elements of the Red Army's 1<sup>st</sup> Ukrainian Front<sup>66</sup> captured the Silesian town of Dyhernfurth<sup>67</sup> and with it the full-scale tabun plant as well as the pilot sarin plant.<sup>68</sup> While no actual chemical agents were acquired – the liquid stockpiles having been pumped into the Oder River – research into the agents would continue in the Soviet-occupied zone in Germany and later on in the USSR when the plant had been rebuilt in its entirety.<sup>69</sup>

The chemical weapons programme in the years immediately following the end of the Second World War was strongly influenced by the belief that the UK needed to possess a retaliation-in-kind capability. With the advent of the German G-agents, many of the old first-generation chemical weapons seemed to be of little use. Carter and Pearson write that, "In comparison, it was difficult to see a future military role for the old lachrymators and sternutators; phosgene was dismissed and even mustard gas now seemed of minor utility."<sup>70</sup> In 1945, approximately 71 000<sup>71</sup> German aircraft tabun

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<sup>64</sup> Chiefs of Staff Committee, Joint Intelligence Committee, Soviet Interests, Intentions and Capabilities, Report by the Joint Intelligence Committee, 6 August 1947. TNA CAB 158/1.

<sup>65</sup> Ibid.

<sup>66</sup> A *front* in the Red Army was equivalent to an US/UK *army group*, which would typically be made up of several armies.

<sup>67</sup> Present day Brzeg Dolny, Poland.

<sup>68</sup> Christopher Duffy, *Red Storm on the Reich: The Soviet March on Germany, 1945* (London: Routledge, 1991), 129-132.

<sup>69</sup> Joachim Krause and Charles K. Mallory, *Chemical Weapons in Soviet Military Doctrine* (Boulder: Westview Press, 1992), 117-118.

<sup>70</sup> Carter and Pearson, "Past British Chemical Warfare Capabilities," 61.

<sup>71</sup> The precise number was 70 697. Report by the Inspector-General of the Royal Air Force on Visit to No. 31 Maintenance Unit – Llandwrog, Report No. 538, 3 May 1956 – TNA AIR 20/8730.

bombs were shipped to the UK as a contingency plan for use against Japan.<sup>72</sup> These bombs were the best available weapons the British had access to and doubled as a supply for research work into nerve agents.

In the postwar period, Chemical Defence Research Establishment (CDRE) Sutton Oak became the UK's centre for development of production methods for chemical warfare agents.<sup>73</sup> After the discovery of German research into nerve agents, an R&D programme aimed at nerve agent production had commenced at Porton Down. Due principally to Sutton Oak being an old and ill-equipped facility and the toxicity of the nerve agents, it was decided in 1947 that a new location for pilot plant studies be chosen.<sup>74</sup> The Royal Air Force (RAF) airfield at Portreath was acquired by the Ministry of Supply (MoS) to be developed as a new Chemical Defence Establishment. Renamed Nancekuke, it was deemed to be more suitable for work on chemical production processes. CDE Nancekuke began operating as a small-scale chemical agent production and research facility in 1951 as an outstation of Porton Down.<sup>75</sup> Eventually, a pilot production facility was built to support R&D into sarin. Production at this plant commenced in 1954 and continued for two years. The planned expansion of the pilot plant to a full-scale production plant was cancelled in 1956 when the decision was taken to discontinue offensive research into chemical warfare. From this point work at Nancekuke concentrated on the small to pilot-scale development of chemicals and agents to support the UK's defensive research programme, which was being directed from Porton Down in Wiltshire. The sarin pilot plant at Nancekuke was shut down after two years and the manufacture of twenty metric tons of agent.<sup>76</sup>

When the Cabinet Defence Committee met on 10 July 1956, there was a proposal put forth by the Minister of Defence, Sir Walter Monckton, to eliminate all offensive developments from the chemical weapons programme. What Monckton suggested was to:

1. Agree that we should abandon the means of large scale production of nerve gas and the development of nerve gas weapons;

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<sup>72</sup> Chief of Staff Committee, Meeting to be held on 19 June 1945, Notes of COS (45) 400 (0), Disposal of German Chemical Warfare Stocks. TNA WO 193/712.

<sup>73</sup> United Kingdom of Great Britain and Northern Ireland, Declaration [to OPCW] of Past Activities Relating to its Former Offensive Chemical Weapons Programme, 27 May 1997, 37. Will be referred to as UK Declaration.

<sup>74</sup> Ibid.

<sup>75</sup> "Nancekuke Remediation Project." UK Ministry of Defence, accessed 16 June 2009, <http://www.mod.uk/DefenceInternet/AboutDefence/WhatWeDo/DefenceEstateandEnvironment/Nancekuke/>.

<sup>76</sup> UK Declaration, 43.

2. Agree that we should dispose of reserve capacity for the manufacture of mustard gas and of our stocks of gas and of filled shells and bombs;
3. Note that we will thereby preclude retaliation in kind from our own resources if we are attacked by such weapons;
4. Note that it is not our intention to abandon research work in the chemical warfare field or development work for defence against chemical warfare.<sup>77</sup>

His reasoning for making this recommendation was British possession of nuclear (fission) weapons, the massive US nuclear arsenal, the US chemical warfare potential and the current economic situation in the UK.<sup>78</sup> The key thing with this proposal was that while offensive developments would be discontinued, R&D was not going to be affected.<sup>79</sup> This decision was taken in secrecy, as there was some concern as to what the Americans would think. The fear was that the US would be reluctant to continue to share information as had happened a number of times previously in the nuclear area.<sup>80</sup> That October, the Defence Research Policy Committee interpreted the Cabinet decision on CW as applying to BW and requested that Cabinet alter the requirement for a retaliatory capability. According to a Defence Research Policy Staff note from 24 October:

The arguments which led to the cancellation of weapons for the offensive use of chemical warfare agents largely apply to BW weapons. The Ministry of Supply paper to be tabled at the next DRPC meeting stresses the covert use of BW agents but the Staff may feel that the time lag between dispersal and effect rules them out in any war concept which involves atomic weapons. However, until the directive mentioned in para.1 above is altered, it will not be possible for the Service Departments – in particular the War Office and the Air Ministry – to delete BW offensive weapon requirements and targets from their lists.<sup>81</sup>

The following March the Minister of Defence gave approval for the disposal of remaining mustard stocks and munitions.<sup>82</sup> The 71 000 German tabun bombs were disposed of in the north Atlantic in 1955-56 during Operation *Sandcastle*.<sup>83</sup> This signalled that the UK was effectively out of offensive CW production. What is less

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<sup>77</sup> Cabinet Defence Committee, Chemical Warfare Policy, Memorandum by the Minister of Defence, 4 July 1956. TNA CAB 131/17.

<sup>78</sup> Ibid.

<sup>79</sup> Interview with Ron Manley, 29 August 2008.

<sup>80</sup> Interview with Gradon Carter, 27 November 2008.

<sup>81</sup> Defence Research Policy Staff. Offensive Biological Weapons. Note by DPRS (Air) 24 October 1959. DEFE 10/281.

<sup>82</sup> UK Declaration, 5.

<sup>83</sup> Report by the Inspector-General of the Royal Air Force on Visit to No. 31 Maintenance Unit – Llandwrog, Report No. 538, 3 May 1956 – TNA AIR 20/8730.

obvious is when the decision to get out of offensive BW production was taken. The original 10 July document makes no mention of BW. It only refers to CW. Though there is little evidence to show how and when the BW decision was taken, it is accepted that the chemical declaration would cover biological weapons as well. This will be examined further in the upcoming section.

## THE BIOLOGICAL WEAPONS PROGRAMME

Early twentieth century British thinking about biological weapons can be traced back to the First World War with German attempts to infect allied livestock and feed with *Bacillus anthracis*, *Pseudomonas mallei*, and a wheat fungus, *Puccinia graminis*.<sup>84</sup> However, according to Gradon Carter, “it seems unlikely that any nation gave any serious thought to biological warfare until the 1920s.”<sup>85</sup> Concerted British interest in BW began during the interwar period. In 1934 Henry Wickham Steed, former editor of *The Times*, claimed that Germany had carried out clandestine tests with biological agent simulants on the London Underground and Paris Metro.<sup>86</sup> Before making his report public, Steed consulted with Sir Maurice Hankey (later Lord Hankey), secretary of the Committee of Imperial Defence, who took the matter to the Medical Research Council (MRC). Three eminent bacteriologists at MRC studied the feasibility of biological warfare and produced a memorandum for the Committee of Imperial Defence.<sup>87</sup> The memorandum was very cautious about Steed’s report and generally dismissed the threat of biological warfare but did draw attention to the problems of public health during

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<sup>84</sup> Martin Hugh-Jones, “Wickham Steed and German Biological Warfare Research,” *Intelligence and National Security*, Volume 7, Number 4 (1992): 381-382.

<sup>85</sup> G. B. Carter, *Chemical and Biological Defence at Porton Down: 1916-2000* (London: The Stationery Office, 2000), 43.

<sup>86</sup> These findings concerned the Soviets as well as the British and French, but it was the Soviets who thought, the British might resort to bacteriological weapons, which they derided as “a novel type of warfare prepared in bourgeois countries.” Ivan Velikanov, “Bacterial Warfare,” *Sovietskaja Wojennaja Enziklopedija* [Soviet Military Encyclopedia] Volume 2, 100-102. Cited in Valentin Bojtsov and Erhard Geissler, “Military Biology in the USSR, 1920-45,” in *Biological and Toxin Weapons: Research, Development and Use from the Middle Ages to 1945*. SIPRI Chemical & Biological Warfare Studies Volume 18, ed. Erhard Geissler and John Ellis van Courtland Moon. (Oxford: Oxford University Press, 1999), 155, note 10.

<sup>87</sup> These were Professor John Ledingham, Director of the Lister Institute; Professor William Topley of the London School of Hygiene and Tropical Medicine; and Captain Stewart Ranken Douglas, Deputy Director of the MRC’s National Institute for Medical Research. During and after the First World War, the MRC had played an occasional role in defence matters, see Brian Balmer, *Britain and Biological Warfare: Expert Advice and Science Policy, 1930-65* (Basingstoke: Palgrave, 2001), 15.

wartime, suggesting that compromised public health conditions could make the population more vulnerable to disease.<sup>88</sup>

In November 1936 the Bacteriological Warfare Subcommittee was set up with Lord Hankey in the chair.<sup>89</sup> On 17 March the following year, the Bacteriological Warfare Subcommittee produced its first report dealing with foot-and-mouth disease.<sup>90</sup> A second report followed in April 1938 that reiterated the latest intelligence and summarized the activities initiated within the armed services and other areas.<sup>91</sup>

### *BW and the Second World War*

When Britain declared war on Germany the possibility of a deliberate BW attack became an increasing concern. On 27 November 1939 the War Cabinet decided that the former Committee of Imperial Defence, Bacteriological Warfare Subcommittee should be reconvened as the Biological Warfare Committee under Lord Hankey.<sup>92</sup> During the first meeting of the Biological Warfare Committee, offensive BW research was discussed in reference to a memorandum prepared by eminent Canadian scientist, Sir Frederick Banting, which warned of the biological weapons threat facing Britain and France. Banting was convinced that Germany had been conducting research into BW prior to the outbreak of the war. He claimed that:

While Germany knows that we are prepared for bombing and even gas attack, and would be able to retaliate, she probably knows that we are unprepared for bacterial warfare, even as we know that she has for years carried out experiments, and now knows, in all likelihood, the possibilities, limitations and conditions necessary for the successful use of bacteria in warfare.<sup>93</sup>

While the Bacteriological Warfare Committee dismissed Banting's warnings as alarmist, the possibility of a biological attack, including "bacteriological sabotage" was starting to gain traction.<sup>94</sup> Following the debate on Banting's memo in early 1940,

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<sup>88</sup> Committee of Imperial Defence Subcommittee on Bacteriological Warfare, Note by the Joint Secretaries, 4 November 1936. TNA WO 188/648.

<sup>89</sup> See page 20, note 35.

<sup>90</sup> Committee of Imperial Defence Subcommittee on Bacteriological Warfare, Report, 17 March 1937. TNA WO 188/648.

<sup>91</sup> Committee of Imperial Defence Subcommittee on Bacteriological Warfare, 2<sup>nd</sup> Report, 29 April 1939. TNA WO 188/648.

<sup>92</sup> War Cabinet, Bacteriological Warfare, Note by the Minister for Co-ordination of Defence, WP (G)(39)112, 21 November 1939. TNA WO 188/653.

<sup>93</sup> Memorandum by Sir Frederick Banting to the National Research Council of Canada on the Present Situation Regarding Bacterial Warfare, paper No. BW (40) 2. TNA WO 188/663.

<sup>94</sup> War Cabinet, Bacteriological Warfare Committee, Comments on Sir Frederick Banting's Memorandum, BW (40) 3, 25 January 1940. TNA WO 188/653; War Cabinet, Bacteriological Warfare



Hankey argued that further research was needed and suggested that offensive possibilities of BW should also be explored more extensively in order to improve defensive capabilities. That autumn, the “Biology Department, Porton” at Chemical Defence Experimental Station Porton was established under Paul Fildes.<sup>95</sup>

The capitulation of France in June 1940 prompted a shift in policy from “offence for defence to offence for retaliation” and with the new research establishment in place, efforts were soon underway to create a biological weapon.<sup>96</sup> In December 1941, Hankey proposed the development of ‘cattle cakes’ – linseed cakes contaminated with anthrax spores – as a potential weapon against livestock in order to disrupt German food production.<sup>97</sup> In January 1942 the Cabinet Defence Committee affirmed its policy to undertake research in order to be able to retaliate with biological weapons without undue delay and approved Hankey’s plans to produce anthrax cattle cakes for retaliatory purposes.<sup>98</sup> Also in January, scientists from the US, UK and Canada met in Ottawa to discuss biological warfare collaboration between the three countries.<sup>99</sup> Taking part in the discussions from the UK were Paul Fildes and Professor Dudley Maurice Newitt, who represented the interests of Special Operations Executive. It should be noted that while they were permitted to discuss biological warfare issues, it was to be done with the pronouncement that British research was “defensive and protective.”<sup>100</sup> This was an interesting time in the relationship of the three wartime allies. There was significant collaboration between them in the areas of nuclear, biological and chemical weapons research. As we will see, this would not always be the case.

The months of July, August and September saw a number of BW tests on Gruinard Island. Gruinard Island is a small island off the northwest coast of Scotland, roughly halfway between the towns of Gairloch and Ullapool. It was here that multiple tests of

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Committee, Precautions Against Sabotage, Note by Security Service, 8 March 1940. TNA WO 188/663; War Cabinet, Bacteriological Warfare Committee, Precautions Against Bacteriological Sabotage, Note by the Joint Secretaries, 24 June 1940. TNA WO 188/663.

<sup>95</sup> War Cabinet, Bacteriological Warfare Committee, Further Experiments on Methods of Spread of Bacteria, Note by the Chairman, 23 September 1940. TNA WO/188/653.

<sup>96</sup> Gradon Carter and Brian Balmer, “Chemical and Biological Warfare and Defence, 1945-90,” in *Cold War, Hot Science: Applied Research in Britain’s Defence Laboratories, 1945-90*, ed. Robert Bud and Philip Gummet. (Amsterdam: Harwood Academic, 1999), 309-310.

<sup>97</sup> Hankey to Prime Minister, 6 December 1941. TNA CAB 120/782.

<sup>98</sup> Notes on a meeting held at Lord Hankey’s office on Friday 30 January 1942. TNA WO 188/654.

<sup>99</sup> Donald H. Avery, *The Science of War: Canadian Scientists and Allied Military Technology During the Second World War* (Toronto: University of Toronto Press, 1998), 158.

<sup>100</sup> The precise wording was, “They must, however, make it clear that our principal aim in these studies and experiments was defensive and protective; that we should in no circumstances initiate these forms of frightfulness, although the possibility of retaliation, e.g., under pressure of public demand, could not be excluded.” Letter – Professor Newitt to Fildes, 12 February 1942. TNA WO 188/654.

the new anthrax bomb were field tested during Operation *Vegetarian*. The anthrax bomb was a modified high-explosive chemical bomb, filled with a liquid suspension of anthrax spores. The bombs were exploded at rest as well as dropped from aircraft.<sup>101</sup> One of the tests included an aerial drop of a twenty-five-pound anthrax bomb.<sup>102</sup> In October there were further trials with aircraft at Penclawdd, Wales. This occurred due in part to the previous aircraft bomb tests at Gruinard proving to be somewhat of a failure. By April the following year, approximately seven cattle, two horses, three cats and between thirty and fifty sheep had died on the shores of Wester Ross. Fildes reported to the Chair of the BW Committee that:

There can be little doubt that the outbreak of anthrax that has taken place was due to a carcase being washed up from the island. I approved of the method of disposal, but unfortunately the demolition charge was too great and one or perhaps two sheep were blown into the sea and could not be recovered. This was an unfortunate mischance which will not occur again.<sup>103</sup>

More tests would take place at Gruinard between July and September 1943. Plans to develop a retaliatory biological capability were in the pipeline. The planned “N bomb” was to be a 500 lb. cluster bomb, containing just over 100 smaller 4 lb. anthrax submunitions.<sup>104</sup> This cluster bomb was the precursor to Project Red Admiral, which is discussed in an upcoming section. As well as developing the anthrax cluster bomb plans to develop anthrax cattle cakes were moving forward. Operation *Vegetarian*, soon to be renamed Operation *Aladdin*, saw the preparation of 5 000 000 anthrax cakes to be used against what Gradon Carter describes as “Germany’s already weak agricultural sector” and to more importantly, “underline the principle of retaliation-in-kind.”<sup>105</sup>

In early 1944, a committee was set up under the Chiefs of Staff in order to control biological warfare research and development. The Inter-Services Subcommittee on Biological Warfare (ISSBW) was made up of representatives of the Ministry of Supply as well as the four branches of the British Forces. The ISSBW was responsible for:

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<sup>101</sup> The aerial drop was ultimately unsuccessful as the bomb impacted the earth in a soft, peaty area. War Cabinet, Bacteriological Warfare Committee, Note of an Informal Meeting, BW(42)14, 19 October 1942. TNA WO 188/653.

<sup>102</sup> Tom Mangold and Jeff Goldberg, *Plague Wars: The Terrifying Reality of Biological Warfare* (New York: St. Martin’s Press, 1999), 30.

<sup>103</sup> Letter – Fildes to Duff Cooper, 19 April 1943. TNA WO 188/654.

<sup>104</sup> Carter, *Chemical and Biological Defence at Porton Down*, 64.

<sup>105</sup> *Ibid*, 65.

Advising on the formulation of the general policy for biological warfare research in the light of service needs, operational factors, etc. Responsibility for the administration of the research work and for obtaining the necessary financial credits, etc. is vested in the Ministry of Supply, and the Director-General of Scientific Research (MoD) has been charged with the responsibility within the Ministry for the new Microbiological Research Department at Porton, which is under the direction of Dr DW Henderson as Chief Superintendent.<sup>106</sup>

The ISSBW in effect replaced the Bacteriological Warfare Committee, which, according to Fildes, had been sidelined by Lord Hankey due to the committee's contrary advice regarding biological warfare issues. Brian Balmer states that, "This opposition of the BW Committee could be construed as a product of their opinions on the complexity of establishing epidemic disease."<sup>107</sup> It was hoped that the new committee would be involved in helping shape the future of postwar biological warfare planning in the UK.

On 11 July 1946, the Biological Research Advisory Board (BRAB) was set up, in order to obtain independent scientific advice on problems arising during the course of biological warfare research.<sup>108</sup> According to the terms of reference, BRAB was, "to consider and advise on biological problems with special reference to micro-biological research carried out in the Ministry of Supply and extra-murally."<sup>109</sup> The Advisory Council on Scientific Research and Technical Development was the body to which BRAB reported. Lord Hankey was installed as BRAB Chairman, with Professor E. C. Dodds, Sir Howard Florey, Lord Stamp and Sir Paul Fildes<sup>110</sup> all consenting to serve as members of the Board as well as representatives of the MoS.<sup>111</sup>

The Board also included three scientists that were also appointed to ISSBW, thereby providing some sort of consistency throughout this process. Research into biological warfare received equal priority to that of the nuclear programme.<sup>112</sup> Though the

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<sup>106</sup> Ministry of Supply, Advisory Council on Scientific Research and Technical Development, Biological Research Advisory Board, Constitution and Terms of Reference and Relation to other Committees, Note by Secretary S.A.C, 11 July 1946. TNA WO 195/9087.

<sup>107</sup> Balmer, *Britain and Biological Warfare*, 53.

<sup>108</sup> Ministry of Supply, Advisory Council on Scientific Research and Technical Development – Biological Research Advisory Board, Constitution and Terms of Reference and relation to other Committees, Note by Secretary S.A.C, 11 July 1946. TNA WO/195/9087.

<sup>109</sup> Ibid.

<sup>110</sup> Fildes received his knighthood in 1946. G. P. Gladstone, B. C. J. G. Knight and Sir Graham Wilson, "Paul Gordon Fildes: 1882-1971," *Biographical Memoirs of Fellows of the Royal Society*, Volume 19 (1 December 1973): 339.

<sup>111</sup> Ministry of Supply, Advisory Council on Scientific Research and Technical Development – Biological Research Advisory Board, Constitution and Terms of Reference and relation to other Committees, Note by Secretary S.A.C, 11 July 1946. TNA WO/195/9087.

<sup>112</sup> Chiefs of Staff Committee, Biological Warfare Subcommittee, Division of Responsibilities, BW(47)32, 3 November 1947. TNA WO 188/667.

understanding of using biology for military purposes was in its infancy during the postwar period, interest continued to grow, eventually culminating with Project Red Admiral.

### *Project Red Admiral and BW Testing*

In November 1946, in a Top Secret document composed by the Air Staff, several key points in regard to requirements for a biological bomb were outlined. The interest in an air-deliverable biological weapon was due much in part to British opinions on strategic defence in the postwar period. According to Brian Balmer:

The rapid expansion of the British biological warfare research programme was in part, a response to the perceived threat of a similar attack against the nation coupled with the broader position of the Chiefs of Staff on their preparedness to use weapons of mass destruction. Growth was also driven by a more proximate Air Staff requirement, dating from immediately after the Second World War, for an anti-personnel biological bomb to be in operation by 1955.<sup>113</sup>

Air Staff Requirement (ASR) OR/1006 was the document that embodied the Air Staff's initial thoughts on a British anti-personnel biological bomb. Balmer states that it was planned to be "comparable in strategic effect with the atomic bomb."<sup>114</sup> Seven requirements were laid out in OR/1006 that were to be met:

1. The Air Staff require the development on high priority of an anti-personnel bomb containing a biological agent.
2. The bomb is intended for strategic use against industrial targets and should contain the most effective biological agent for the incapacitation of workers.
3. The bomb should be designed to achieve the most economical distribution of the biological material on the assumption that the aircraft will be able to make only a single run over the target.
4. The bomb should be capable of being aimed from heights of up to 50 000 feet and at speeds of up to 500 knots. The contents should not be adversely affected by atmospheric conditions at these altitudes nor by temperature or humidity conditions in any part of the world.
5. If possible the outer container of the bomb should permit its stowage in the space required by one of the series of ballistically stable bombs now under design. The bomb should not need special precautions in handling and loading.
6. In selecting the biological technique, the necessity should be borne in mind of later occupying the contaminated area with our own forces.

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<sup>113</sup> Balmer, *Britain and Biological Warfare*, 79.

<sup>114</sup> Chiefs of Staff Committee, BW Subcommittee, Note by Ministry of Supply, 17 November 1947. TNA WO 188/660.

7. The bomb should be available for carriage in the B3/45 and the long-range and medium bombers now being schemed. To this end, development should be completed in 5 years' time.<sup>115</sup>

The following October a new ASR was distributed that cancelled OR/1006 as well as OR/1002, which was a request for the production of a strategic gas bomb.<sup>116</sup> The new ASR provisioned that the Air Staff required a toxic weapon for use against personnel in enemy industrial areas with the objects of:

- a. Reducing the enemy's means of making war by causing widespread incapacitation of the workers.
- b. Reducing the enemy's will to make war by producing the maximum adverse effect on morale.<sup>117</sup>

Whether the Chief of the Air Staff actually believed that this was possible is not clear. But what is clear is the Air Staff had ambitious plans and were intent on having a biological bomb operational by 1955.

Between 1948 and 1953 a series of biological tests were carried out in the Caribbean and in the Hebrides. In August 1948 Operation *Harness* began, which was the release of biological agents at Parham Sound, off the coast of Antigua.<sup>118</sup> More tests occurred between June and September 1952 with Operation *Cauldron*. This was the testing of *Brucella suis* and *Pasturella pestis* on monkeys in the Hebrides.<sup>119</sup> Operation *Hesperus* began in 1953 and involved the testing of *B. suis* and *Francisella tularensis*.<sup>120</sup> The following February to May was Operation *Ozone*. This was the testing of *B. suis*, *F. tularensis* and Venezuelan equine encephalomyelitis (VEE) on animals in the Bahamas.<sup>121</sup> Operation *Negation* followed, which saw field trials of *B. suis*, *F. tularensis* and *Vaccinia* virus off the coast of the Bahamas.<sup>122</sup>

<sup>115</sup> Air Staff Requirement for a Biological Bomb, OR/1006, 10 May 1947. TNA AIR 20/8727.

<sup>116</sup> Air Staff Requirement No. OR/1065, 12 November 1947. TNA AIR 20/8727.

<sup>117</sup> Ibid.

<sup>118</sup> Brian Balmer, "The UK Biological Weapons Program," in *Deadly Cultures: Biological Weapons Since 1945*, ed. Mark Wheelis, Lajos Rózsa and Malcolm Dando. (Cambridge: Harvard University Press, 2006), 54-55.

<sup>119</sup> Ministry of Supply, Advisory Council on Scientific Research and Technical Development, Biological Research Advisory Board, Further Comments by Sir Paul Fildes and Lord Stamp on Operation Cauldron, 25 November 1952. TNA WO 188/668.

<sup>120</sup> Ministry of Supply, Advisory Council on Scientific Research and Technical Development, Biological Research Advisory Board – Operation Hesperus, 1953, Draft Programme by the Chief Superintendent, H.R.D., 29 January 1953. TNA WO 188/668.

<sup>121</sup> Ministry of Supply, Advisory Council on Scientific Research and Technical Development, Biological Research Advisory Board, Minutes of the Thirty-Second Meeting of the Board, 15 June 1954. TNA WO 188/668.

<sup>122</sup> Ministry of Supply, Advisory Council on Scientific Research and Technical Development, Biological Research Advisory Board, Minutes of the Thirty-Fourth Meeting of the Board, 3 June 1955. TNA WO 188/670.

Prior to the end of the sea trials, policy concerning BW had begun to shift. With a new government in power, a Conservative one, the Chiefs of Staff undertook an extensive review of British strategic policy. At the twenty-seventh meeting of BRAB, on 6 December 1952, Dr. Owen Wansbrough-Jones attempted to clarify the Chiefs of Staff policy towards BW. Wansbrough-Jones stated that the Chiefs of Staff could give broad direction and had agreed on a policy that, “research and trials to determine the true risk of BW should be continued, the best defensive measures should be established, and that we should concentrate mainly on the study of long-range offensive possibilities.”<sup>123</sup> The phrase “long-range” is an interesting choice of words. Carter, Pearson and Balmer believe that long-range is taken to mean long-term.<sup>124</sup> Interest in offensive biological warfare capabilities had started to decrease and according to Carter and Balmer, research into biological warfare had begun to shift to the defensive in 1953.<sup>125</sup> Economic concerns, the war in Korea, changes in strategic doctrine and the success of Operation *Hurricane* in October 1952 all contributed to the diminished role of BW.

Air Staff Target (AST) OR/1065 from July 1954 effectively cancelled the anti-personnel biological bomb project. The memo read:

To implement the national policy of retaliation in the event of biological warfare being initiated by an enemy, the Air Staff will ultimately require toxic biological weapons. In 1947 an Air Staff Requirement No. OR/1065 was issued for such a weapon which it was hoped would be available to the Service by 1955. It is now apparent that because of the magnitude of the problem a great deal of research still remains to be done in both the agent and weapon fields before a satisfactory weapon can be recommended to the Service. Moreover it appears that the storage, transportation, testing and preparation for use of the weapon and its agent will present new problems to the Service and may necessitate the provision of special skills and equipment. The Air Staff considers that until problems associated with the toxic biological weapons are better appreciated it would be unwise to state definite requirements for weapons and other equipment. This AST is therefore issued to replace ASR No. OR/1065 which is hereby cancelled.<sup>126</sup>

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<sup>123</sup> Ministry of Supply, Advisory Council on Scientific Research and Technical Development, Biological Research Advisory Board, Minutes of the Twenty-Seventh Meeting of the Board, 6 December 1952. TNA WO 188/668.

<sup>124</sup> See Brian Balmer, “The Drift of Biological Weapons Policy in the UK, 1945-1965,” *Journal of Strategic Studies*, Volume 20, Number 4 (December 1997): 115-145; Gradon Carter and Graham S. Pearson, “North Atlantic Chemical and Biological Research Collaboration: 1916-1995,” *Journal of Strategic Studies*, Volume 19, Number 1 (March 1996): 74-103.

<sup>125</sup> Carter and Balmer, “Chemical and Biological Warfare and Defence,” 315.

<sup>126</sup> Air Staff Target No. OR/1065, Biological Warfare Agents and Weapons, and the Associated Problems of their Storage and Handling Under Service Conditions. TNA AIR 20/8727.

What is interesting is that while this AST replaced ASR OR/1065, it did explicitly state that the Air Staff would “ultimately require toxic biological weapons” but that was not going to be any time soon.

With the biological bomb project on the shelf and research being primarily defensive in nature, fewer resources were being allocated to the BW programme. In September 1954 the ISSBW was dissolved.<sup>127</sup> The official reason given was that the committee had lost its effectiveness and had essentially become a rubber-stamping operation. Balmer suggests that, “At a symbolic level, removal of the committee can be construed as an indicator of the waning regard for biological weapons in the minds of defence policy-makers.”<sup>128</sup> Following the success of the *Hurricane* test and the resources being pumped into the thermonuclear programme, it is of little wonder that the biological weapons programme withered in size, scope and importance. The postwar British economy was in such poor shape that there were not the resources to spread around to all of these different programmes. While there was a point in 1946-47 where biological warfare issues did receive priority on par with nuclear issues, that period was relatively short lived, though it was at this time the decision to begin construction of a new “purpose-built facility” at Porton, which was a significant commitment of resources, was taken.<sup>129</sup>

When the Cabinet Defence Committee met on 10 July 1956, the decision was taken to discontinue offensive production of chemical weapons. Six days previously, a memorandum on chemical warfare policy by Minister of Defence, Sir Walter Monckton, was circulated that outlined his ministry’s current CW policy.<sup>130</sup> Interestingly there is no reference to biological weapons anywhere in either Monckton’s memo, or in the official records of the Cabinet Defence Committee meetings. That autumn, a note from the Defence Research Policy Staff interpreted the Cabinet Defence Committee decision to mean, “The arguments which led to the cancellation of weapons for the offensive use of chemical warfare agents largely apply to BW weapons.”<sup>131</sup> The reasons Monckton listed for cancelling the offensive chemical programme are all valid

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<sup>127</sup> Disbandment of the BW and CW Subcommittees. Note by the Chairman, 16 July 1955. TNA WO 188/666.

<sup>128</sup> Balmer, *Britain and Biological Warfare*, 155.

<sup>129</sup> Peter M. Hammond and Gradon B. Carter, *From Biological Warfare to Healthcare: Porton Down, 1940-2000* (Basingstoke: Palgrave, 2002), 76-92.

<sup>130</sup> Cabinet Defence Committee, Chemical Warfare Policy, Memorandum by the Minister of Defence, 4 July 1956. TNA CAB 131/17.

<sup>131</sup> Defence Research Policy Staff, Offensive Biological Weapons, Note by DRPS (Air), 24 October 1956. TNA DEFE 10/281.

when looking at the biological programme. Economic considerations, the possession of British, as well as American nuclear weapons, and the existence of the US BW programme, which had recently come to reflect a new, more offensive policy, could have influenced the decision, or in this case the non-decision to cancel the offensive BW programme.<sup>132</sup> It is also possible that since the British biological weapons programme was not as comprehensive as the chemical or nuclear programmes, a separate and distinct policy decision on the fate of BW may not have been necessary.

While the government had decided to get out of the production and stockpiling of CW, these weapons were going to continue to play a part in British strategic planning.<sup>133</sup> The weapons were not going to be British chemical weapons, but American. The Chiefs of Staff saw no real need for the UK to continue its offensive programmes since it was unlikely that the US were going to get out of CBW any time soon. This was reflected in a memo from July 1958 that stated:

We agree with existing policies that the United Kingdom needs no offensive or retaliatory capability in either BW or CW, provided that capability is retained by the West as a whole. There seems little doubt that in the near future the United States will continue to have such an offensive capability.<sup>134</sup>

By getting out of offensive production and in terms of a strategic deterrent, Britain was going to rely on its stockpile of nuclear fission weapons as well as the soon-to-be tested thermonuclear device.

## THE NUCLEAR WEAPONS PROGRAMME

The genesis of the British nuclear weapons programme can be traced back to the early days of the Second World War. In February 1940 émigré physicists Otto Frisch and Rudolf Peierls, working at Birmingham University, completed their memorandum entitled, ‘On the Construction of a “Super-bomb”; based on a Nuclear Chain Reaction in Uranium’ in which they postulated that five kilograms of Uranium 235 was all that was necessary for an atomic explosion.<sup>135</sup> The memorandum stated, “The energy liberated by a 5kg bomb would be equivalent to that of several thousand tons of dynamite, while

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<sup>132</sup> Interview with Brian Balmer, 4 August 2008.

<sup>133</sup> Interview with Ron Manley, 29 August 2008.

<sup>134</sup> Chiefs of Staff Committee, Joint Planning Staff. Biological and Chemical Warfare. Report by the Joint Planning Staff, 30 July 1958. TNA DEFE 41/156.

<sup>135</sup> Robert Serber, *The Los Alamos Primer: The First Lectures on How to Build an Atomic Bomb* (Berkeley: University of California Press, 1992), 79-88.



that of a 1kg bomb, though about 500 times less, would still be formidable.”<sup>136</sup> Frisch and Peierls memorandum was given to Professor Mark Oliphant, also of Birmingham University, who passed it on to Sir Henry Tizard, the Chairman of the Committee on the Scientific Survey of Air Defence. This memo would eventually result in the formation of a committee of government officials, scientists and university academics, in April. The committee would become known as the Maud Committee.

#### *Maud Committee and Wartime Collaboration*

The Maud Committee was originally comprised of Committee Chair Sir George Paget Thomson, Marcus Oliphant, P. B. Moon, Patrick Blackett, James Chadwick and John Cockcroft.<sup>137</sup> The precise origin of the committee’s name is somewhat unclear. Initially it was thought to be a coded message from Danish physicist Neils Bohr who was residing in Denmark when it was invaded and occupied by German forces. Bohr had sent a message to Otto Frisch instructing him to pass his words on to "Cockcroft and Maud Ray Kent." It was initially thought that Maud Ray Kent was an anagram – somewhat misspelled – for radium taken, meaning that the Germans had come into the possession of some valuable Scandinavian radium. The name had stuck and it was not until after the war that Maud Ray Kent was identified as the former governess of Bohr's children who moved to the English county of Kent.

They came together to attempt to develop a research programme on isotope separation and fast fission.<sup>138</sup> The first Maud Committee report was completed in March 1941 and it described the importance of fast fission for bomb design. A copy of the report was sent to the Secretary of the US Uranium Committee, Lyman Briggs.<sup>139</sup> The final two reports of the Maud Committee were completed on 15 July the same year. The first report, entitled, 'Use of Uranium for a Bomb' concluded that an atomic bomb was feasible. The report described design possibilities in technical detail as well as providing specific proposals for bomb development and initial cost estimates.<sup>140</sup> The second report was titled, 'Use of Uranium as a Source of Power'. This report concluded that the controlled fission of uranium could be used to provide energy in the form of heat for use in machines as well as providing large quantities of radioisotopes, which could be used

<sup>136</sup> Memorandum on the properties of a radioactive “super-bomb.” TNA AB 1/210.

<sup>137</sup> MAUD Policy Committee, Minutes, 1<sup>st</sup> Meeting, 10 April 1940. TNA AB 1/347.

<sup>138</sup> Ibid.

<sup>139</sup> Richard Rhodes, *The Making of the Atomic Bomb* (London: Simon & Schuster, 1986), 372-373.

<sup>140</sup> Report by M.A.U.D Committee on the use of Uranium for a Bomb. TNA AB 1/8.

as a substitute for radium.<sup>141</sup> The Maud Committee was a significant early development in the timeline of the British nuclear weapons programme. According to Margaret Gowing:

The Maud Reports were a fitting climax to the work of the Committee. Indeed in its fifteen months' existence it had proved itself one of the most effective scientific committees that had ever existed. Under its aegis much brilliant and original scientific work had been done and this had been welded together into a remarkably coherent and complete whole. Theoreticians and experimentalists, physicists and chemists, many of them endowed with real mechanical flair, had worked together with an efficiency that seems in retrospect quite extraordinary.<sup>142</sup>

The primary focus of the Maud Committee revolved around answering two related questions. First, whether or not the creation of a uranium bomb was at all scientifically possible. Some advances in physics had recently been made to make people believe that it was at least *theoretically* possible to create an atomic explosion, thousands of times greater than what was possible with conventional explosives. Second, it dealt with whether the British and their allies could make an atomic device before the Germans. To the British it was an intolerable, though very real thought, that the Germans could conceivably have a bomb before they would. There were some signs that the Germans were working on a uranium bomb from April 1940 right through to 1941.<sup>143</sup> It was also important that the UK and its allies harness the power of the atom before Hitler's scientists were able to. This was a hugely motivating factor for the British. According to Gowing, "All except the convinced pacifists were deeply committed to the war and to the defeat of Nazi Germany: the refugees from Europe who played such an important part in the development of the bomb were the most deeply committed of all."<sup>144</sup> Plans to develop an atomic bomb were officially endorsed by Prime Minister Winston Churchill on 3 September 1941.

Churchill was personally interested in the concept of harnessing the power of the atom. He thought that if something were to come out of the theoretical research that was being done at laboratories and universities in the UK, it could be potentially decisive in

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<sup>141</sup> Report by M.A.U.D Committee on the use of Uranium as a Source of Power. TNA AB 1/8.

<sup>142</sup> Margaret Gowing, *Britain and Atomic Energy: 1939-1945* (London: Macmillan, 1964), 80.

<sup>143</sup> See Paul Lawrence Rose, *Heisenberg and the Nazi Atomic Bomb Project: A Study in German Culture* (Berkeley: University of California Press, 1988); John Cornwell, *Hitler's Scientists: Science, War and the Devil's Pact* (London: Penguin Books, 2003).

<sup>144</sup> Gowing, *Britain and Atomic Energy*, 87.

the war against Germany. Many individuals working on the bomb project shared this feeling. As Margaret Gowing explains:

The use of the bomb was to arouse passionate feelings among scientists.... at this stage their task seemed clear and it still seems clear in retrospect: even those scientists who worked on the wartime bombs and who were to regret most bitterly their release on Japan, would have regarded the victory of Germany in the Second World War as a far greater evil.<sup>145</sup>

Throughout the remainder of 1941 there was a concerted effort within the British government to push forth with its atomic aspirations. That autumn the Directorate of Tube Alloys was formed within the Department of Scientific and Industrial Research. This is what the British atomic weapons research project was to be called. According to Gowing, "The name Tube Alloys was to prove an excellent cover name: this meaningless and unintelligible expression had a 'specious air of probability about it' and might be taken by the uninitiated to have a connection with aeroplane radiators or tanks."<sup>146</sup> The formation of Tube Alloys would bring together again many of the scientists that had worked on the Maud Committee reports, thereby establishing continuity in relation to the subject matter.

Meanwhile in the US the situation on the atomic front was continuing to develop. After receiving both Maud Committee reports in July, Lyman Briggs had locked the reports away in his safe, without giving them much of a read. In August, Professor Marcus Oliphant, Maud Committee member and Birmingham University physicist, went to the US to discuss the findings of the Maud Reports and to gauge US reaction. Oliphant soon realized that Briggs had not read the documents and encouraged him to circulate the reports amongst his colleagues. On 9 October, Vannevar Bush, director of the newly created Office of Scientific Research and Development (OSRD), convinced US President Franklin Roosevelt of the need for an accelerated nuclear programme.<sup>147</sup> Throughout 1940-41 the study of nuclear fission was the primary focus of the American efforts. On 6 December, one day before the Japanese attack at Pearl Harbor was the first meeting of the US Top Policy Group, which was created to inform Roosevelt of bomb development, and allow Bush and his colleagues to guide the

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<sup>145</sup> Ibid., 88.

<sup>146</sup> Ibid., 109.

<sup>147</sup> Richard G. Hewlett and Oscar E. Anderson, *The New World: 1939-1946* (University Park: Pennsylvania State University Press, 1962), 45-46.

project.<sup>148</sup> This all changed the following day. When the smoke had finally cleared in Hawaii and the US government realized that they had been dragged into war with Imperial Japan, priorities shifted. On 18 December US interest in atomic energy issues switched from studying nuclear fission to investigating the feasibility of developing atomic weapons.<sup>149</sup> War had come to the US and it was at this point that they became as serious as the British about developing an atomic weapon.

On 22 December Churchill arrived in Chesapeake Bay, Virginia aboard the HMS *Duke of York*. He came to the US in order to meet Roosevelt regarding the conduct of the war in the aftermath of the attack at Pearl Harbor. One of the table was a commitment of continued diplomatic and military cooperation between the two countries.<sup>150</sup> Churchill knew that the key to allied victory in Europe lay in the economic and military might of the US. In these talks, codenamed *Arcadia*, Churchill and Roosevelt met daily between 22 December and 14 January to discuss all aspects of the war effort from North Africa to Southeast Asia to atomic energy. These early meetings between the two charismatic leaders were crucial to the ongoing war effort and to the eventual development of atomic weapons.

The amount of resources as well as the sheer scale of the atomic programme meant that it would be difficult for Britain to allocate sufficient money, manpower and materiel to the atomic programme while conducting an air campaign in Europe along with operations in the Pacific. This led Sir John Anderson, the minister responsible for the Tube Alloys project, to advise Churchill that the scale and cost of the atomic bomb project required the UK to base its efforts in the US.<sup>151</sup> The rest of 1942 would see the ever-increasing involvement of the US in the fledgling British atomic programme. That August, a new organization was created under the auspices of the Army Corps of Engineers, with the intentionally misleading name of "Manhattan Engineer District."<sup>152</sup> On 17 September, Colonel Leslie Richard Groves was notified that he was to take immediate control of Manhattan Project.<sup>153</sup> The formal order that outlined Groves'

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<sup>148</sup> This group consisted of Vice President Henry Wallace, Secretary of War Henry L. Stimson, Army Chief of Staff George C. Marshall, Chairman of the National Defence Research Committee James B. Conant and Dr. Vannevar Bush. Rhodes, *The Making of the Atomic Bomb*, 378.

<sup>149</sup> Hewlett and Anderson, *The New World*, 53.

<sup>150</sup> See David J. Bercuson and Holger H. Herwig, *One Christmas in Washington: Roosevelt and Churchill Forge the Grand Alliance* (New York: Overlook Press, 2005).

<sup>151</sup> Note from Sir John Anderson to Churchill, 30 June 1942. TNA PREM 3/139/8A.

<sup>152</sup> Gerard DeGroot, *The Bomb: A History of Hell on Earth* (London: Pimlico, 2005), 33-34.

<sup>153</sup> Abraham Pais, *J. Robert Oppenheimer: A Life* (Oxford: Oxford University Press, 2006), 40-41. For a rethinking of the appointment of Groves to head the Manhattan Project see, Barton J. Bernstein,

responsibilities stated that “he was to be tasked with taking complete charge of the entire DSM<sup>154</sup> project as well as drawing up the plans for the organization, construction, operation... and security of the project, and after approval, take the necessary steps to put it into effect.”<sup>155</sup> Robert Norris states that:

Total program authority was vested in Groves. He had the complete support of the president and the other high officials of the administration... The objective was clear, unmistakable, finite, and well defined. Compartmentalization, in addition to maintaining security, kept people focused on their assignment to achieve it.<sup>156</sup>

Many of the individuals working on the Manhattan Project were foreign nationals from Europe, Britain and Canada. Lots of individuals came together in order to facilitate the development of an atomic weapon to be used with the hope of ending the war. This was what Groves was single-mindedly focused on the entire time he was in charge of the bomb project.

The early years of the Manhattan Project saw a heightened level of cooperation between the US and UK. On 19 August 1943, during the *Quadrant* meetings, the Quebec Agreement was signed by Winston Churchill and Franklin Delano Roosevelt, which outlined the terms of nuclear non-proliferation between the United Kingdom and the United States. As John Simpson explains, “The Quebec Agreement bound the two states never to use atomic weapons against each other, only to use them against another country with the other’s consent, and never to transfer atomic information obtained as a consequence of the agreement to third parties without the other’s acquiescence.”<sup>157</sup> That December a team of nineteen British-based scientists, including Otto Frisch, Rudolf Peierls and Francis Simon of Oxford University, arrived in the US to begin work at Los Alamos.<sup>158</sup> British scientist William Penney arrived In June 1944 to begin work at the Los Alamos National Laboratory. Penney spent one year working on the implosion

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“Reconsidering the ‘Atomic General’: Leslie R. Groves,” *The Journal of Military History*, Volume 67, Number 3 (July 2003): 883-920.

<sup>154</sup> Laboratory for the Development of Substitute Materials (DSM) was the original name of the Manhattan Project. William J. Broad, “Why They Called it the Manhattan Project,” *New York Times*, 30 October 2007, F1.

<sup>155</sup> Top Secret, File 25, Folder B, Tab 8, cited in Robert S. Norris, *Racing for the Bomb: General Leslie R. Groves, the Manhattan Project’s Indispensable Man* (South Royalton: Steerforth Press, 2002), 187.

<sup>156</sup> Norris, *Racing for the Bomb*, 228.

<sup>157</sup> John Simpson, *The Independent Nuclear State: The United States, Britain and the Military Atom* (London: Macmillan, 1983), 25.

<sup>158</sup> This group consisted of E. Bretscher, B. Davison, A. P. French, O. R. Frisch, K. Fuchs, J. Hughes, D. J. Littler, W. G. Marley, D. G. Marshall, P. B. Moon, R. E. Peierls, W. G. Penney, G. Placzek, M. J. Poole, J. Rotblat, H. Sheard, T. H. R. Skyrme, E. W. Titterton and J. L. Tuck. Gowing, *Britain and Atomic Energy*, 262.

process component of the atomic chain reaction, which sent powerful shock waves inwards on to a radioactive core.<sup>159</sup> This was important as Penney ended up the key figure in the development of the British independent atomic weapons programme.

Like the *Quadrant* and *Arcadia* meetings between Churchill and Roosevelt earlier in the war, the Second Quebec Conference, codenamed *Octagon*, produced an equally important document regarding postwar US-UK collaboration. Signed on 19 September 1944, The Hyde Park Agreement laid out, in principle, between the US and UK, an agreement that “promised that full collaboration between the two countries in developing Tube Alloys for military and commercial purposes should be continued after the defeat of Japan unless and until terminated by joint agreement.”<sup>160</sup> Churchill and Roosevelt both agreed that the bomb project should be kept in the utmost secrecy and that full collaboration between the two nations in the military and commercial development of the atom should continue after the war. Any suggestion that the world be informed about the bomb as a prelude to an international agreement regarding its control and use, the agreement noted, was “not accepted.” Both sides were firmly committed to the defeat of Germany and victory in the Pacific. Churchill saw the atomic bomb as a war-winning weapon and was prepared to do whatever it would take to ensure victory.

Churchill’s focus on the European theatre was obstinate. Throughout his meetings with President Roosevelt, Churchill was adamant that something needed to be done to help ease the pressure on the Soviet Union and create a second front on the continent.<sup>161</sup> Roosevelt was less confident that this was the proper course of action. The US Commander-in-Chief was fixated on the Pacific theatre and the threat that Imperial Japan posed to US interests.<sup>162</sup> Churchill was reluctant to accept second-tier status for the war effort in Europe and was pressing the Americans hard to commit to decisive action on the continent. The Prime Minister was of the belief that the Nazi threat should be dealt with first and foremost.

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<sup>159</sup> Brian Cathcart, *Test of Greatness: Britain’s Struggle for the Atom Bomb* (London: John Murray, 1994), 26-47.

<sup>160</sup> Aide memoire of conversation between the President and the Prime Minister at Hyde Park, September 18, 1944. TNA PREM 3/139/8A.

<sup>161</sup> Creating a second front in Europe was eventually agreed upon during the Casablanca Conference from 14-24 January 1943, which culminated in the Allied invasion of Sicily (Operation *Husky*), beginning in June 1943. Field Marshal Lord Alanbrooke, *War Diaries: 1939-1945*, ed. Alex Danchev and Daniel Todman. (London: Phoenix, 2002), 355-368.

<sup>162</sup> The war in the Pacific required an immense commitment of men and resources due to the sheer size of the theatre, which encompassed the bulk of the Pacific Ocean from the Aleutian Islands to the northern coastline of Australia.

Throughout 1944 and 1945, allied forces pushed deeper into occupied France and the Low Countries. With the successes of the US 7<sup>th</sup> and British 8<sup>th</sup> Armies in the Italian theatre, the Allies had firmly established military operations in two separate European combat theatres. Coupled with the Red Army's powerful push westward, it was only a matter of time until the war in Europe ended. This meant that no atomic weapon would be used in the European theatre as Alfred Jodl, Chief of Staff of OKW<sup>163</sup> signed the instrument of unconditional surrender at approximately 02:30 on 7 May, with the cessation of operations to occur on 8 May at 23:01 CET.<sup>164</sup>

Though the opportunity to test the atomic bomb in Europe did not materialize, the war in the Pacific was still raging. The Battle of Okinawa was fought over an eighty-two day period and was the largest amphibious assault in the Pacific Theatre during the war. This costly battle claimed the lives of 10 000 American troops, 110 000 Japanese Imperial forces and culminated in the mass suicide of over 100 000 civilians at the behest of the Japanese Imperial Army, rather than be taken "prisoner" by the invading forces.<sup>165</sup> Allied losses in the weeks leading up to the atomic bombings of Hiroshima and Nagasaki were significant. With the bloody Battle of Okinawa complete, casualties were averaging around 7000 per week.<sup>166</sup> This was due primarily to the *kamikaze* tactics of the Imperial Japanese Army Air Force and the attack wings of the Imperial Japanese Navy.<sup>167</sup> Facing an enemy, desperate to avoid the humiliation of unconditional surrender, the decision was taken by newly sworn-in President Harry Truman.

On 4 July 1945, Churchill gave British approval for the atomic bombs to be dropped on Japan.<sup>168</sup> The final test was still a few weeks away, but since the US was still encountering fierce resistance in the Pacific, it was accepted that the bombs would be dropped on the Japanese Home Islands. At precisely 05:29:45 local time on 16 July 1945, the atomic device codenamed *Gadget*, was detonated in the Jornada del Muerta, located within the Alamogordo Bombing Range in central New Mexico, forty-eight kilometres southeast of the town of Socorro.<sup>169</sup> The resultant explosive yield of *Gadget* was between 20 and 22 kilotons (kt), with initial estimates placing the yield at 18.6

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<sup>163</sup> *Oberkommando der Wehrmacht*. This translates in to English as High Command of the Armed Forces.

<sup>164</sup> "Act of Military Surrender Signed at Rheims at 02:41 on the 7th day of May 1945, English text." The Avalon Project, Yale Law School, accessed 23 April 2010, <http://avalon.law.yale.edu/wwii/g3.asp>.

<sup>165</sup> John W. Dower, *Embracing Defeat: Japan in the Wake of World War II* (New York: W. W. Norton, 1999), 54.

<sup>166</sup> Paul Fussell, *Thank God for the Atom Bomb and Other Essays* (New York: Summit Books, 1988), 18.

<sup>167</sup> *Ibid.*

<sup>168</sup> Gowing, *Britain and Atomic Energy*, 372.

<sup>169</sup> See Hewlett and Anderson, *The New World*.

kt.<sup>170</sup> Three weeks later, two separate atomic weapons designs were deployed, on 6 August over Hiroshima and on 9 August over Nagasaki. These two incidents would be the first and last times that nuclear weapons of any type would be used in active combat. Truman's decision was not taken lightly or rashly. It was made pragmatically and in the interest of ending the war in the Pacific and limiting the numbers of American casualties. Subsequently the decision to use atomic weapons against Japan has come under intense scrutiny from all sides in the debate.<sup>171</sup> Truman remained steadfast in his belief that he did what was necessary to facilitate the end of the bloodiest and most destructive war in human history.

### *British Defence Economics and Postwar Progress*

The euphoria of the end of the war in Europe brought about political change in the UK. Gone was Churchill's Wartime Coalition Government, replaced by the Labour Party led by Clement Attlee, with a majority of 146 seats in the House of Commons.<sup>172</sup> Churchill was lauded as the man to lead Britain to victory during the war, but was not seen to be the man to lead it through postwar reconstruction. The electorate believed that Attlee's Labour Party would provide Britain with the appropriate roadmap toward social and economic recovery. The postwar years would prove to be difficult as food and goods continued to be rationed and Britain's shattered infrastructure was rebuilt. It was within this social and political environment that the decision to go for an independent nuclear weapons programme was made.

After the end of the Second World War the United Kingdom was faced with considerable difficulty. Having fought a global war for over six years took its toll on HM Treasury. Needing a sizeable investment of capital to undertake a large-scale reconstruction of parts of Britain, Attlee's government looked towards the US for support. At the beginning of the war Britain was able to pay the US (and Canada) directly, for war materiel under the cash and carry scheme.<sup>173</sup> But, as T. O. Lloyd explains, "Once the United States had committed itself to providing unlimited credit for

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<sup>170</sup> DeGroot, *The Bomb*, 61-63.

<sup>171</sup> See Gar Alperovitz, *The Decision To Use the Atomic Bomb and the Architecture of an American Myth* (New York: Alfred A. Knopf, 1995); *Hiroshima in History: The Myths of Revisionism*, ed. Robert James Maddox. (Columbia: University of Missouri Press, 2007).

<sup>172</sup> Peter Hennessy, *Never Again: Britain 1945-1951* (London: Vintage, 1992), 67.

<sup>173</sup> For a detailed description of the cash and carry scheme see, W. K. Hancock and M. M. Gowing, *British War Economy* (London: His Majesty's Stationery Office, 1949), 101-136.



the purchase of raw materials and food, the limits on resources were relaxed.”<sup>174</sup> What transpired as a result was on 11 March 1941, US Public Law 77-11, better known as the Lend-Lease Act, was enacted. Under the agreement of Lend-Lease the UK received large quantities of equipment and supplies from the US totalling approximately \$30 billion. In return the US received leases on military installations in Newfoundland and the British West Indies. On 2 September 1945, Lend-Lease was cancelled leaving the British government drastically short of the finances needed for postwar reconstruction. As a result, the UK took a loan for \$586 million (about £145 million at 1945 exchange rates), and a further \$3750 million line of credit (about £930 million at 1945 exchange rates).<sup>175</sup> The loan was to be paid off in fifty annual repayments starting in 1950, although there were six years when payment was deferred in the 1970s due to economic crises and pressure on the official reserves.<sup>176</sup>

Some food items and household materials were still being rationed into the 1950s. Petrol rationing ended on 26 July 1950, sweets in February 1953 and sugar in September 1953. The end of all food rationing occurred on 4 July 1954, with meat and bacon being the last food items to be rationed. According to Hancock and Gowing, “From the invasion of Normandy onwards, a steady stream of papers came before the War Cabinet making it clear, in forceful terms, that the state of British external finances would be by far the gravest economic problem facing the country, once peace came into sight.”<sup>177</sup>

The British economy was shifting from a wartime economy focused primarily on the production of war materials to providing assistance for the greater society. As mentioned previously, this was the era of the development of the British welfare state, the origins of which came to prominence in the pages of the 1942 Beveridge Report. This report discussed three guiding principles intended to create a national social security system that revolved around family allowances, the creation of a National Health Service and full employment.<sup>178</sup> These ideas culminated in the establishment of the 1946 National Insurance Act, the National Health Service Act 1946, and the 1948

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<sup>174</sup> T. O. Lloyd, *Empire, Welfare State, Europe: History of the United Kingdom 1906-2001* (Oxford: Oxford University Press, 2002), 223-224.

<sup>175</sup> Finlo Rohrer, “What’s a Little Debt Between Friends?” BBC News – Magazine, accessed 24 March 2010, <http://news.bbc.co.uk/1/hi/magazine/4757181.stm>.

<sup>176</sup> David Smith, “Britain Pays 1945 War Debt” *The Sunday Times*, 24 December 2006, accessed 24 March 2010, <http://business.timesonline.co.uk/tol/business/article1264220.ece>.

<sup>177</sup> Hancock and Gowing, *British War Economy*, 534.

<sup>178</sup> Social Insurance and Allied Service, Report by Sir William Beveridge, November 1942, 9-11. TNA PREM 4/89/2.

National Assistance Act, all coming into effect on 7 June 1948.<sup>179</sup> It was with the 1945 election of the Labour Party that the establishment of the welfare state in the UK began in earnest. As Sidney Pollard explains, “By 1950 the immediate after effects of the war had been overcome, both in the UK and abroad, and the world could settle down to the peaceful creation of wealth which most of its citizens expected after the holocaust.”<sup>180</sup>

The amount of money going into the nuclear programme was a very real concern for both the Attlee and second Churchill governments. How could Britain afford its own independent nuclear deterrent? In November 1951, newly reelected Prime Minister Winston Churchill believed that it was still possible to reestablish wartime collaboration with the US on atomic matters. Initially Churchill was not completely sold on the necessity of Britain possessing its own independent nuclear weapons programme. Writing to Lord Cherwell:

I have never wished, since our decision during the war that England should start the manufacture of atomic bombs. Research, however, must be energetically pursued. We should have the art rather than the article. A large sum of money will have to be provided for this. There is, however, no point in our going into bulk production even if we were able to. When we go to Washington in January we can, I have no doubt, arrange to be allocated a reasonable share of what they have made so largely on our initiative and substantial scientific contribution.<sup>181</sup>

Churchill’s concerns were pragmatic.<sup>182</sup> They were also driven by economic considerations. Research and development into nuclear, biological and chemical weapons is typically a very costly enterprise from a number of perspectives. Creating a resource-intensive nuclear programme is not easy during times of relative austerity. The amount of capital that went into the British atomic weapons programme between the years of 1946 and 1952 totalled £104 million.<sup>183</sup>

Britain in the postwar period was in a slightly better state than the continent but from 1940 onwards the UK survived on US credit.<sup>184</sup> Britain needed to take away resources from conventional forces and demilitarize the economy in order to establish

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<sup>179</sup> Derek Fraser, *The Evolution of the British Welfare State: A History of Social Policy Since the Industrial Revolution* (London: Macmillan, 1973), 212-215.

<sup>180</sup> Here the holocaust is meant to refer to the extermination of Jewish populations during the Second World War. Sidney Pollard, *The Development of the British Economy: 1914-1990* (London: Edward Arnold, 1992), 229.

<sup>181</sup> Prime Minister’s Personal Minute, no. M47c/51, 15 November 1951. TNA CAB 21/2281B.

<sup>182</sup> Interview with John Simpson, 6 August 2008.

<sup>183</sup> Atomic Energy Expenditure, Memo from Lord Cherwell to Churchill, 12 December 1951. TNA PREM 11/297.

<sup>184</sup> Interview with Kristan Stoddart, 6 August 2008.

some civilian infrastructure.<sup>185</sup> It was clear that Britain could not afford to maintain the sort of conventional forces that they had during the First and Second World Wars.<sup>186</sup> As G. C. Peden explains, “Given that British defence expenditure was pressing against the limits of what was economically possible, reliance upon a nuclear deterrent might seem to be a logical way of achieving security at an affordable cost.”<sup>187</sup> It might be difficult to see how developing a nuclear weapons programme from the ground up, was cost effective, but it did provide Britain with a strong independent and strategic deterrent that helped to offset the proposed personnel cuts to the services. The Defence Committee had come to an agreement whereby the total strength of the armed forces should be reduced from 1 227 000 in September 1947 to 713 000 by the end of March 1949.<sup>188</sup> Further reductions were planned during the final days of the Eden government, where the overall size of the armed forces would be reduced to 450 000.<sup>189</sup>

November 1945 saw the creation of the Washington Declaration, which was an agreement in principle between the USA, UK and Canada to share atomic research and technology. This agreement was primarily limited to the atomic energy question though Article (a) states “there should be an extending between all nations the exchange of basic scientific information for peaceful ends” and Article (c) states that “there should be the elimination from national armaments of atomic weapons and of all other major weapons adaptable to mass destruction.”<sup>190</sup> Buoyed by this recent agreement of cooperation, Prime Minister Atlee called for the construction of two reactors to be built in Britain.<sup>191</sup> This decision was made in the view that Anglo-American cooperation in nuclear science was to continue. This was not the case as 1946 would be a difficult year for British nuclear aspirations.<sup>192</sup>

On the other side of the Atlantic the situation was changing. On 16 April, the US

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<sup>185</sup> A long term defence planning memorandum from October 1955, shows the MoS attempting to save £30 million annually in cuts to defence spending. The fear at the time was that the proposed cuts would not only jeopardize its military future but also its commercial future. Chiefs of Staff Committee, Joint Planning Staff, Long Term Defence Programme – Aim, JP (55) Note 19 (Final), 4 October 1955. TNA DEFE 7/964.

<sup>186</sup> Interview with Kristan Stoddart, 6 August 2008.

<sup>187</sup> G. C. Peden, *Arms, Economics and British Strategy from Dreadnoughts to Hydrogen Bombs* (Cambridge: Cambridge University Press, 2007), 260.

<sup>188</sup> Cabinet Defence Committee Meeting minutes, 29 September 1947. TNA CAB 131/5.

<sup>189</sup> Cabinet Policy Review, Long Term Defence Programme, Memorandum by the Minister of Defence, 14 December 1956. TNA CAB 134/1315.

<sup>190</sup> The original text of the agreement can be found as Appendix 4 in Margaret Gowing and Lorna Arnold, *Independence and Deterrence: Britain and Atomic Energy, 1945-1952. Volume I, Policy Making* (London: Macmillan, 1974), 82-84.

<sup>191</sup> Cabinet, Atomic Energy, GEN 75 8<sup>th</sup> Meeting, 18 December 1945. TNA CAB 130/2.

<sup>192</sup> See Gowing and Arnold, *Independence and Deterrence, Volume I*, 131-146.

Combined Policy Committee met to discuss atomic issues. Led by President Truman, the US offer of atomic collaboration laid out in the Washington Declaration was rescinded.<sup>193</sup> That July, Senator Brien McMahon (D-Conn.) tabled a bill that proposed to create a control board of Cabinet officers and other federal officials.<sup>194</sup> This led to a succession of other bills and amendments that sought to limit the sharing of atomic information with other states. Congress passed the McMahon Act on 2 July.<sup>195</sup> Signed into law by the President on 1 August, the newly created Atomic Energy Act of 1946 made it illegal for the newly created Atomic Energy Commission to engage in any information exchanges with any state, including the UK.<sup>196</sup> At a news conference in Tiptonville, Tennessee on 8 October 1945, when asked if the US should be sharing atomic information with its wartime allies, President Truman was quoted as saying, “If they catch up with us on that, they will have to do it on their own hook, just as we did.”<sup>197</sup>

During this period the US, UK and Canada were continuing their wartime collaborations in chemical and biological warfare R&D. As Brian Balmer explains, “the tripartite division of labour established during the Second World War had held, with the UK concentrating on fundamental research while bomb trials continued in both the US and Canada.”<sup>198</sup> Gowing states, “in chemical and biological warfare the programmes of the two countries remained so closely in step as to be virtually integrated.”<sup>199</sup> According to Carter and Pearson, “While the UK’s liaison with the United States and Canada on chemical warfare and defence was of earlier origin and channeled through more formal links, that on biological depended considerably on personal contact and notably through the efforts of Lord Trevor Stamp, one of Fildes’ staff who remained in the USA and Canada from 1943 to 1945.”<sup>200</sup> The First Tripartite Meeting on collaborative research and development of chemical and biological agents and weapons occurred on 18 March 1947, with twenty-one senior individuals from the US, UK and Canada, meeting at the

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<sup>193</sup> Ibid., 106.

<sup>194</sup> See Hewlett and Anderson, *The New World*, 422-423.

<sup>195</sup> Ibid., 520.

<sup>196</sup> Simpson, *The Independent Nuclear State*, 38-39.

<sup>197</sup> “Harry S. Truman, News Conference at Tiptonville Tennessee, 8 October 1945.” The American Presidency Project, accessed 16 May 2011, <http://www.presidency.ucsb.edu/ws/index.php?pid=12319#axzz1MV8zyoL4>.

<sup>198</sup> Balmer, *Britain and Biological Warfare*, 88.

<sup>199</sup> Gowing and Arnold, *Independence and Deterrence, Volume I*, 94.

<sup>200</sup> Gradon B. Carter and Graham S. Pearson, “British Biological Warfare and Biological Defence, 1925-45,” in *Biological and Toxin Weapons: Research, Development and Use from the Middle Ages to 1945*, SIPRI Chemical & Biological Warfare Studies Volume 18, ed. Erhard Geissler and John Ellis van Courtland Moon. (Oxford: Oxford University Press, 1999), 185.

Army Chemical Center, Edgewood, Maryland for “an informal discussion on a US-UK-Canadian research programme on toxicological warfare.”<sup>201</sup> These meetings brought together scientific personnel from the US, UK and Canada, who were working on chemical and biological warfare issues. Carter and Pearson state:

The perceived value of collaborative efforts between America, Britain and Canada remained as an important facet in the BW programme of each nation. The CW communities, which were then preoccupied with evaluating the military significance of the German nerve agents, also recognized the benefits of collaboration. However, it was now evident that the informal and *ad hoc* apparatus for wartime collaboration needed some formalization and structure. Thus, the formalized tripartite co-ordination of research in BW and CW began in 1947.<sup>202</sup>

Collaboration however did not spill over into atomic energy, as John Baylis explains:

Apart from atomic energy, in other respects the defence relationship mirrored the general pattern with the informal defence links of 1946/7 providing a portent of the closer partnership to follow and the attempts to maximize the mutual defence effort in 1948/9 providing one of the most important and distinctive manifestations of the gradual renewal of a more ‘special relationship’ between the two countries.<sup>203</sup>

Other events dealt a blow to Britain’s atomic aspirations. The US Atomic Energy Act moved to severely limit atomic collaboration and information exchange between the US and its wartime allies, effectively ending any hope of nuclear collaboration with the US.

In September 1947, US Secretary of State George C. Marshall decided to reopen dialogue with the UK and Canada regarding nuclear weapons development. British official nuclear historian Margaret Gowing believed that this was due primarily to the US need for Canadian and Congolese uranium ore.<sup>204</sup> However, this led to a thawing in relations between the US and UK, which in turn led to high-level meetings between American, British and Canadian representatives on atomic cooperation. The outcome of these meetings led to the creation of a tripartite agreement on atomic energy in January.<sup>205</sup> This agreement or *modus vivendi* was initially created as an outline of ways in which the three states could collaborate on nuclear weapons designs and

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<sup>201</sup> Carter and Pearson, “North Atlantic Chemical and Biological Research Collaboration,” 83.

<sup>202</sup> Ibid.

<sup>203</sup> John Baylis, *Anglo-American Defence Relations, 1939-1945: The Special Relationship* (Basingstoke: Macmillan, 1984), 45.

<sup>204</sup> Top Secret Cypher Telegram, Despatched by OTP, from Cabinet Office to JSM Washington, CANAM 857, 10 December 1947. TNA CAB 126/137.

<sup>205</sup> Top Secret Cypher Telegram, Despatched by OTP, from Cabinet Office to JSM Washington, ANCAM 966, 6 January 1948. TNA CAB 126/137.

production.<sup>206</sup> While this was not the complete restoration of US-UK collaboration on nuclear research, it was a compromise that in the short term would provide the UK with the belief that the two wartime allies would eventually reestablish the special relationship.

Research and development into a fission bomb continued throughout 1948 and 1949. By August 1949, scientific staff at High Explosive Research (HER) numbered over 300, which was a ten-fold increase over its initial membership.<sup>207</sup> The Labour government was strongly committed to building its nuclear capabilities in the early postwar period. Knowing that the transfer of information between the UK and US had been curtailed due to the Atomic Energy Act, it was going to require a substantial effort on the part of the government, military and scientific community to develop a deliverable, kiloton nuclear weapon. Not only was it important for national prestige concerns and the reestablishment of the special relationship with the US, it was important from the perspective of British security. Attlee had explained the rationale behind the decision to go for nuclear weapons years later in terms of the fear of US isolationist policy and British defence and security:

We had to hold up our position vis-à-vis the Americans. We couldn't allow ourselves to be wholly in their hands, and their position wasn't awfully clear always. At that time we had to bear in mind that there was always the possibility of their withdrawing and becoming isolationist once again. The manufacture of a British bomb was therefore at this stage essential to our defence. You must remember that this was all prior to NATO. NATO has altered things. But at the time although we were doing out best to make the Americans understand the realities of the European situation – the world situation – we couldn't be sure we'd succeed. In the end we did. But we couldn't take risks with British security in the meantime. We had worked from the start for international control of the bomb. We wanted it completely under the United Nations. That was the best way. But it was obviously going to take a long time. Meanwhile we had to face the world as it was. We had to look to our defence – and to our industrial future. We could not agree that only America should have atomic energy.<sup>208</sup>

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<sup>206</sup> Ibid.

<sup>207</sup> HER was previously known as Basic High Explosive Research (BHER). Cathcart, *Test of Greatness*, 115-126.

<sup>208</sup> Francis Williams, *A Prime Minister Remembers: The War and Postwar Memoirs of the Rt. Hon. Earl Attlee, Based on his Private Papers and on a Series of Recorded Conversations* (London: Heinemann, 1961), 117.

However, something was about to happen that would send shock waves through the intelligence world and the repercussions would be felt in London and Washington for some time.

On 29 August, at approximately 07:00 local time, the USSR detonated its first atomic bomb at Semipalatinsk Test Site in the northeastern part of Kazakh SSR. Called *First Lightning* and codenamed *Joe-1*, by the British and Americans, this shot had an explosive yield of 22 kt.<sup>209</sup> A few days after the detonation, on 1 September, a B-29 operated by the US Air Force's Weather Service departed Misawa Air Force Base on the Japanese island of Honshū bound for Eilson Air Force Base in Alaska. The B-29 was equipped with special filters, which were designed to detect atmospheric radiological debris. Upon examining the aircraft's filters trace amounts of radioactivity were found.<sup>210</sup> In order to determine whether or not a nuclear detonation had occurred, more flights were made in order to collect more meteorological data. After discussions with numerous scientists, government officials and representatives from the UK, it was determined that the Soviet Union had indeed detonated a nuclear device in late August.<sup>211</sup>

The British Atomic Energy Authorities were informed of American suspicions on 10 September at 11:30 prior to a "mass of air containing radioactivity" that was due to pass north of Scotland. Two converted Handley Page Halifax bombers were dispatched from RAF bases in Gibraltar and Aldergrove, Northern Ireland, equipped with filters similar in design to British Army standard issue gas masks.<sup>212</sup> The flight departing from RAF Aldergrove returned with traces of radioactive debris, while the other did not.

What was most surprising about this test from the British and American point of view was not that the Soviets were able to develop and detonate a nuclear device but the timing in which this occurred. In a 23 September statement Truman publicly announced evidence of the first Soviet atomic explosion. He stated:

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<sup>209</sup> David Holloway, *Stalin and the Bomb* (New Haven: Yale University Press, 1994), 213-218.

<sup>210</sup> "US Intelligence and the Detection of the First Soviet Nuclear Test, September 1949." The National Security Archive, accessed 25 November 2009, <http://www.gwu.edu/~nsarchiv/nukevault/ebb286/>.

<sup>211</sup> For a comprehensive analysis of the Soviet nuclear weapons programme, see Holloway, *Stalin and the Bomb*.

<sup>212</sup> See Michael S. Goodman, *Spying on the Nuclear Bear: Anglo-American Intelligence and the Soviet Bomb* (Stanford: Stanford University Press, 2007), 46-49.

Ever since atomic energy was first released by man, the eventual development of this new force by other nations was to be expected. This probability has always been taken into account by us.<sup>213</sup>

He also claimed that:

Nearly 4 years ago I pointed out that "scientific opinion appears to be practically unanimous that the essential theoretical knowledge upon which the discovery is based is already widely known. There is also substantial agreement that foreign research can come abreast of our present theoretical knowledge in time." And, in the Three-Nation Declaration of the President of the United States and the Prime Ministers of the United Kingdom and of Canada, dated November 15, 1945, it was emphasized that no single nation could in fact have a monopoly of atomic weapons.<sup>214</sup>

In a CIA memo dating from July 1948, from Director Roscoe Hillenkotter to President Truman, it was believed that the Soviets were still a few years away from possessing a nuclear device. The report states:

On the basis of the evidence now in our possession, it is estimated that the earliest date by which it is remotely possible that the USSR may have completed its first atomic bomb is mid-1950, but the most probable date is believed to be mid-1953.<sup>215</sup>

It was thought that the Soviet Union's reserves of raw materials were more of a "potential rather than actual strength." Compared with the US and UK one can see that in 1946 the Soviet Union was well behind the US in terms of resource reserves. The total reserves of uranium available to the Soviet programme were believed to be low as well, which would have proven to be a significant obstacle for its enrichment programme. Barely four years had elapsed since the first US test in the New Mexico desert. The American nuclear monopoly was no more. How did this happen? How were the Soviets able to detonate a nuclear device so quickly? All this occurred, as we have seen, years before the US and UK thought possible. President Truman, in the wake of the *Joe-1* shot, announced a crash programme to develop a fusion or hydrogen bomb on 31 January 1950.<sup>216</sup>

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<sup>213</sup> "Statement by President Harry S. Truman Announcing the First Atomic Explosion in the USSR, 23 September 1949." Harry S. Truman Library and Museum, accessed 25 November 2009, <http://www.trumanlibrary.org/publicpapers/index.php?pid=1234&st=&st1>.

<sup>214</sup> Ibid.

<sup>215</sup> "Estimate of Soviet Capabilities in the Field of Atomic Energy, 13 July 1949." US Air Force, Executive Directorate of Intelligence memo, accessed 25 November 2009, <http://www.gwu.edu/~nsarchiv/nukevault/ebb286/doc04.PDF>.

<sup>216</sup> Richard Rhodes, *Dark Sun: The Making of the Hydrogen Bomb* (New York: Simon & Schuster, 1995), 407-408.



**TABLE 2. PRODUCTION IN BASIC ITEMS**

	USSR	USA	UK
Steel (millions of tons)	14	61.6	12.7
Coal (millions of tons)	168	524.8	189
Oil (millions of tons)	21.7	248	n/a
Motor Vehicles	132 000	3 096 000	365 000

Source: Chiefs of Staff Committee, Joint Intelligence Subcommittee, Soviet Interests, Intentions and Capabilities – General: Report by the Joint Intelligence Subcommittee. JIC (47) 7/2. TNA CAB 158/1.

Many questions concerning how the Soviets were as quick to develop a nuclear device were answered over the course of February and March. On 3 February 1950, German-born physicist Klaus Fuchs was charged with passing nuclear secrets to the Soviet Union.<sup>217</sup> The previous autumn, the FBI had intercepted Soviet cable traffic indicating that there was a spy operating out of the Manhattan Project.<sup>218</sup> Fuchs first began working on the Tube Alloys project in 1941 after an approach from Rudolf Peierls. In 1943, Fuchs was sent to Columbia University in New York then on to Los Alamos where he was employed in the theoretical physics division under Hans Bethe.<sup>219</sup> Fuchs' primary area of research dealt with the issues surrounding the implosion of the fissionable core of the plutonium design. He returned to Britain after the war and became deputy scientific director of the British Atomic Energy Research Institute at Harwell, outside Oxford until his arrest in 1950.<sup>220</sup> Fuchs was released from prison nine years into his fourteen-year sentence, eventually emigrating to East Germany.<sup>221</sup>

### *Operation Hurricane*

On 25 October 1951, Sir Winston Churchill and the Conservative Party won the British General Election with a majority of twenty-six.<sup>222</sup> This was significant as Churchill placed a strong emphasis in the idea of developing a substantial nuclear

<sup>217</sup> Ibid., 413.

<sup>218</sup> Kai Bird, *American Prometheus: The Triumph and Tragedy of J. Robert Oppenheimer* (New York: Vintage Books, 2005), 434.

<sup>219</sup> "Klaus Fuchs Biography." Atomic Archive, accessed 25 November 2009, <http://www.atomicarchive.com/Bios/Fuchs.shtml>.

<sup>220</sup> Bart Barnes, "Nuclear Physicist Klaus Fuchs, One-time Spy for Soviets, Dies," *Washington Post*, 29 January 1988, C8.

<sup>221</sup> Richard Norton-Taylor, "Nuclear Secrets Spy Dies in East Germany," *The Guardian*, 29 January 1988.

<sup>222</sup> "Mr. Churchill Prime Minister: A Small Majority for Conservatives," *The Times*, 27 October 1951, 6.

weapons programme in the UK and was a key supporter of Tube Alloys before it was subsumed into the Manhattan Project. That November, Churchill was briefed on the previous government's work on the nuclear bomb project. Churchill was surprised as to how the Attlee government was able to conceal the size, scope and cost of the project from Parliament.<sup>223</sup> Churchill initially felt that it might be better for Britain to possess "the art rather than the article" meaning research into developing a nuclear device should continue, though stopping short of the genuine article.<sup>224</sup> Churchill's Paymaster General, Lord Cherwell, was one his most influential advisors in nuclear issues and was a great supporter of an independent British nuclear programme. His influence with Churchill was such that it was never really a question of whether or not Britain would possess a deliverable thermonuclear device. The Attlee government during the previous five years had already taken many of the important nuclear decisions. Over £100 million had already been allocated to the nuclear programme by the time Churchill returned to 10 Downing Street.<sup>225</sup> Nevertheless, the new government made plans that would ensure the test of an independent British nuclear weapon by the end of 1952.

With the British nuclear programme moving forward at a steady pace, decisions needed to be made regarding the testing of the fission device. In February 1951 the British Chiefs of Staff had agreed that the first atomic bomb trial would be a ship-borne test, tentatively scheduled for late 1952.<sup>226</sup> The other big question was where would the test occur? A few years earlier the search for a suitable location had begun with sites in Australia, Canada, South Africa and the US short-listed.<sup>227</sup> On 27 December 1951, the head of High Explosive Research, Dr. William Penney, informed Australian Prime Minister Robert Menzies that the preferred site for the British nuclear test would be the Monte Bello Islands.<sup>228</sup> It was initially hoped that test sites in the US would be available to the British for *Hurricane*. Unfortunately the Americans were not prepared to offer their test sites to the British until they were ready to, "put forward further proposals for tripartite cooperation."<sup>229</sup> The nuclear relationship between the US and UK had become strained in light of the Fuchs affair and while it was hoped that a British nuclear test in

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<sup>223</sup> Churchill note to Sir Edward Bridges, 8 December 1951. TNA PREM 11/297.

<sup>224</sup> See page 82, note 181.

<sup>225</sup> Atomic Energy Expenditure, Memo from Lord Cherwell to Churchill, 12 December 1951. TNA PREM 11/297.

<sup>226</sup> Gowing and Arnold, *Independence and Deterrence, Volume II*, 477-478.

<sup>227</sup> Lorna Arnold and Mark Smith, *Britain, Australia and the Bomb: The Nuclear Tests and their Aftermath* (Basingstoke: Palgrave Macmillan, 2006), 17-20.

<sup>228</sup> Gowing and Arnold, *Independence and Deterrence, Volume I*, 336-337.

<sup>229</sup> *Ibid.*, 307.

the US could be seen as a purely military exercise and not as a scientific endeavour, this was not the case. The Monte Bello test site off the northwest coast of Australia would be the location for Britain's first nuclear detonation or 'shot'.

On 8 June 1952 a River class frigate, the HMS *Plym*, embarked for Australia with the nuclear test device safely on board. This device was very similar in structure and composition to the first US atomic device detonated at Alamogordo in 1945.<sup>230</sup> The plutonium implosion device was successfully detonated at 09:15 on 3 October in a bay off Trimouille Island off the west coast of Australia.<sup>231</sup> The estimated yield was 25 kt. With this test, Britain had become the third nuclear weapons state behind the US and USSR. While the test was ultimately successful it was overshadowed a few weeks later. On 31 October the US tested the first fusion device as part of Operation *Ivy*, on Enewetak, an atoll in the Marshall Islands. Based on the Teller-Ulam design *Ivy Mike* was the first full test of a 'staged' fusion bomb. *Ivy Mike's* yield was a staggering 10.4 megatons (Mt).<sup>232</sup> According to Peter Hennessy, this device produced a yield that was twice the power of all of the explosives used during the Second World War.<sup>233</sup> Sixteen days later the US detonated *Ivy King* at Enewetak. This explosion was the largest pure fission nuclear bomb ever tested by the United States, with a yield of 500 kt.<sup>234</sup> The Teller-Ulam staged fusion bomb design set a new standard for sheer destructive power. If the UK was going to reestablish its strategic partnership with the US, then possessing thermonuclear weapons was necessary.

### *The Hunt for Fusion*

While the *Hurricane* test was universally acknowledged as successful, its significance relating to US-UK atomic cooperation was less so. It was hoped that *Hurricane* would suitably impress the Americans and that it would lead to renewed cooperation between the two former Allies on atomic issues. With the megaton blast of *Ivy Mike* atomic cooperation seemed much less likely. In fact Congressman William Harrison (R-Wyoming) was noted in a poll conducted by the *Washington Star* that

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<sup>230</sup> See Gowing and Arnold, *Independence and Deterrence, Volume II*, 442-475.

<sup>231</sup> *Ibid.*, 493.

<sup>232</sup> Barton J. Bernstein, "Crossing the Rubicon: A Missed Opportunity to Stop the H-Bomb?" *International Security*, Volume 14, Number 2 (Autumn 1989): 133.

<sup>233</sup> Peter Hennessy, *Cabinets and the Bomb* (Oxford: Oxford University Press, 2007), 86.

<sup>234</sup> "Operation Ivy, 1952 - Enewetak Atoll, Marshall Islands." Nuclear Weapon Archive, accessed 15 February 2009, <http://nuclearweaponarchive.org/Usa/Tests/Ivy.html>.

atomic cooperation with Britain would be “trading a horse for a rabbit.”<sup>235</sup> Britain could not afford to rest on the results of *Hurricane*. If atomic cooperation and the renewal of the special relationship was the goal, Britain needed to prove its worth and get that seat at the table. On 7 January President Truman, in his Annual Message to the Congress on the State of the Union, announced the development of the hydrogen bomb.<sup>236</sup>

With Truman’s statement, it soon became more of a question of “when” as opposed to “if” in whether the UK would try and develop nuclear fusion weapons.<sup>237</sup> This was further reinforced on 12 August –when the USSR detonated what it claimed was its first thermonuclear device. In reality *Joe-4* was a hybrid device that included a thermonuclear component. The yield of *Joe-4* was estimated around 400 kt.<sup>238</sup> In November the RAF received delivery of the first air-deliverable nuclear weapon. The Mark I bomb, Blue Danube, was the first air-deliverable nuclear weapon to be wholly developed in the UK. It measured five feet wide by twenty feet long and its design yield was variable between five and twenty kilotons.<sup>239</sup> Blue Danube was to be delivered by the new Vickers Valiant strategic bomber.

The year 1954 would prove to be an important one for the British thermonuclear programme. On 13 April, Prime Minister Churchill informed his ministers at the GEN 464 Cabinet Subcommittee meeting<sup>240</sup> that he would like the full Cabinet to authorize the manufacture of a hydrogen bomb.<sup>241</sup> One year prior to the GEN 464 meeting, Lord Cherwell informed the Cabinet that he thought it necessary to create a body similar to the United States Atomic Energy Commission (USAEC), funded by the Treasury and responsible to MoD, to oversee the thermonuclear programme.<sup>242</sup> In early 1953 a committee under former Chancellor and Home Secretary Lord Waverley was set up to make recommendations as how best to transfer the nuclear programme to a public

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<sup>235</sup> *Washington Star* poll, 2 January 1953, Representative William H. Harrison (R-Wyoming), taken from note 5, Chapter 12 of Gowing and Arnold, *Independence and Deterrence, Volume I*, 480.

<sup>236</sup> “Harry S. Truman, Annual Message to the Congress on the State of the Union, 7 January 1953.” The American Presidency Project, accessed 10 February 2009, <http://www.presidency.ucsb.edu/ws/index.php?pid=14379>.

<sup>237</sup> Interview with Lorna Arnold, 5 September 2008.

<sup>238</sup> Holloway, *Stalin and the Bomb*, 307.

<sup>239</sup> Simpson, *The Independent Nuclear State*, 93.

<sup>240</sup> GEN 464 was an *ad hoc* committee of ministers that were brought together to discuss the decision to develop thermonuclear weapons. GEN 464 included Churchill in the chair; Anthony Eden (Foreign Secretary), R. A. Butler (Chancellor of the Exchequer), Lord Alexander (Minister of Defence), Lord Swinton (Commonwealth Secretary), and Lord Salisbury (Lord President). Note of a Meeting of Ministers held in the Prime Minister’s Room, House of Commons, SW1 on 13 April 1954, GEN 464 1<sup>st</sup> Meeting – Atomic Energy Development. CAB 130/101.

<sup>241</sup> *Ibid.*

<sup>242</sup> Simpson, *The Independent Nuclear State*, 96-97.

enterprise.<sup>243</sup> The Chiefs of Staff meanwhile submitted their general strategic assessment to the Defence Policy Committee (DPC) on 1 June.<sup>244</sup> Eight days later another memorandum from the Chiefs of Staff laid out recommendations regarding H-bomb research and production.<sup>245</sup> Suggestions laid out in the Waverley Report and the subsequent Atomic Energy Authority Act of 1954 would lead to the creation of the United Kingdom Atomic Energy Authority (UKAEA) on 19 July.<sup>246</sup>

Throughout the process, Cabinet was not always in agreement. Lorna Arnold argues that there were five major questions discussed by the Cabinet: costs, the moral issue, the need for influence and standing in world affairs, concern that other European nations, particularly Germany, might also want to produce thermonuclear weapons and the need to justify production of thermonuclear weapons to public opinion.<sup>247</sup> Churchill mistakenly thought that on 7 July he had the Cabinet's support to go ahead with the thermonuclear programme. He did not as Cabinet had decided to defer its decision. Finally, on 27 July, upon the recommendations of the Chiefs of Staff and the Defence Policy Committee, Cabinet agreed to move forward with the development of a thermonuclear weapons programme.

With the decision now taken it remained to be seen exactly which route towards developing a thermonuclear weapon Britain would take. A Chiefs of Staff report from November 1954 identified two types of thermonuclear devices, Type A:

could be based on the present Mark I bomb but would be more efficient with a redesigned implosion system. Such a weapon would weigh about 12,000 lbs., have a diameter of 60 inches and would yield between 1 and 1.5 MT; its fissile material would cost about four times as much as that in a mixed 20 KT Mark I bomb. The chief advantages of this type are relative simplicity and comparatively small demands for special material.<sup>248</sup>

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<sup>243</sup> Waverley Committee, Responsibility for Atomic Weapons, Memorandum by the Ministry of Supply, 18 May 1953. TNA AB 16/1075; Waverley Committee, Introductory Note by the Joint Secretaries, 10 March 1953. TNA AB 16/1075.

<sup>244</sup> According to Peter Hennessy, "DPC was essentially a fusion of Churchill's GEN 464 inner group with the Home Secretary, the junior service ministers and the Chiefs of Staff." Peter Hennessy, *The Secret State: Whitehall and the Cold War* (London: Penguin Books, 2002), 54.

<sup>245</sup> Cabinet Committee on Defence Policy, Hydrogen Bomb Research and Production in the United Kingdom – Memorandum by the Chiefs of Staff, DP(54)7, 9 June 1954. TNA CAB 134/808.

<sup>246</sup> "Revised Statute from The UK Statute Law Database, Atomic Energy Authority Act 1954 (c.32)." UK Legislation, accessed 28 November 2009, [http://www.opsi.gov.uk/RevisedStatutes/Acts/ukpga/1954/cukpga\\_19540032\\_en\\_1](http://www.opsi.gov.uk/RevisedStatutes/Acts/ukpga/1954/cukpga_19540032_en_1).

<sup>247</sup> Lorna Arnold, *Britain and the H-Bomb* (Basingstoke: Palgrave, 2001), 55.

<sup>248</sup> Working Party on the Operational Use of Atomic Weapons, Future Programme for the Development of Nuclear Weapons, 3 November 1954. TNA DEFE 7/2208.

## Type B:

Could be based on Red Beard which is a physically small atomic detonator. While exact estimates cannot yet be given, this type would give an H-bomb smaller in diameter, lighter in weight and of a higher yield than that of Type A for the same expenditure of fissile material and money.<sup>249</sup>

It was believed the Type A device would be more achievable in foreseeable future, whereas Type B was still more or less in the theoretical stages. Because Type A was seen as more similar to the plutonium implosion device used previously, it was thought that Britain's best chance in achieving thermonuclear weapons lay with this particular method. However if the secrets of the H-bomb could be unlocked, it was this technology that would prove to be the most desirable for British nuclear deterrence. The report also made three key recommendations regarding R&D priorities for the Atomic Weapons Research Establishment (AWRE). They were:

1. Development of the Type B H-bomb, including development of a Red Beard type of 'detonator', with a yield of about 5 MT, with a view to trial of the warhead in late 1958 and production of 10 bombs a year from 1959.
2. Development of Red Beard as a warhead for an aircraft bomb ('in-flight insertion and extraction' not to be included in the initial production) and for ground-to-ground guided weapons.
3. Further development of the Mark I warhead to raise the power by mixing and boosting to the greatest extent possible consistent with the use of the minimum amount of fissile material necessary to ensure detonation, but without involving any further considerable development.<sup>250</sup>

The idea was to get an air-deliverable megaton bomb into service as quickly as possible. And the shortest route to it was going to be through a boosted fission device. Type B design's main problem dealt with the production of lithium-6, which was technically difficult to produce and that it was needed in large quantities for large yield radiation implosion weapons.<sup>251</sup> According to Lorna Arnold, "No one in the UK had ever produced lithium metal in anything more than fractions of a gram, much less separated the isotopes (lithium-6 and lithium-7) in quantity, or made lithium compounds and used them to fabricate components."<sup>252</sup> John Simpson states that:

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<sup>249</sup> Ibid.

<sup>250</sup> Ibid.

<sup>251</sup> Donald McIntyre, *Project Crystal: Lithium 6 for Thermonuclear Weapons*, UK Nuclear History working paper no. 5, Mountbatten Centre for International Studies, 2.

<sup>252</sup> Arnold, *Britain and the H-Bomb*, 84.

The first half of 1955 thus produced a series of decisions on the military exploitations of nuclear energy which led to a transformation of the nature of the project as it had evolved over the previous ten years, and injected a pervading sense of urgency into it. It no longer had a single, finite and limited aim but was concerned now both to develop new types of weapons and achieve a substantial stockpile of operational ones.<sup>253</sup>

Eventually it was decided that a Type B hydrogen bomb would be possible and that was where the bulk of AWRE's efforts should lie.<sup>254</sup>

The culmination of the efforts into developing a thermonuclear weapon was to occur in May 1957 with the *Grapple* tests. Envisaging the Pacific tests scheduled for spring 1957 was an interesting situation. From a logistical perspective, the Pacific trials would require a significant effort as *Grapple* would be the single biggest combined operation since the Second World War, including a large civilian component as well as the three branches of the Armed Forces.<sup>255</sup> In total, 3515 individuals were involved in the *Grapple* trials.<sup>256</sup> As a result, plans for the trials were going ahead, whereas it was not clear which types of devices would be tested. When the trials were conceived in late 1955, there were four weapon designs that were initially favoured. They were:

1. *Green Bamboo*, a single spherical device with a thermonuclear component.
2. A version of G2, the second round to be fired in June 1956 in the *Mosaic* trial at Monte Bello (the *Mosaic* G2, was intended to have a lead tamper, but a uranium tamper was planned for the *Grapple* version).
3. *Orange Herald*, a megaton boosted fission round.
4. *Green Granite*, a cylindrical bomb, a hydrogen bomb employing a radiation implosion technique – a design discussed at Aldermaston at least as far back as January 1955.

Three of the four original designs were actually boosted or Type A weapons. Only *Green Granite* was a Type B device. The final list of devices to be tested in the *Grapple* trials underwent a few permutations, as there were specific issues that affected the ability of one or more of the devices to be adequately tested.<sup>257</sup> In the end the three devices that were tested were:

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<sup>253</sup> Simpson, *The Independent Nuclear State*, 103.

<sup>254</sup> This decision was a complicated process of theoretical possibilities and scientific discovery and is much too complex for the scope of this chapter. The definitive account of this period can be found in Lorna Arnold, *Britain and the H-Bomb*.

<sup>255</sup> *Ibid.*, 142.

<sup>256</sup> 1722 men came from the Royal Navy, 636 were Army, 1038 RAF and 117 from AWRE. *Ibid.*, 241.

<sup>257</sup> For example, *Green Granite* would not fit into the nose cone of the intermediate range ballistic missile (IRBM) that was currently being developed, as a result it was abandoned due to this significant design flaw. Arnold, *Britain and the H-Bomb*, 133.

1. *Short Granite*, a two-stage thermonuclear modified, 'close proximity' version of Green Granite.
2. *Orange Herald*.
3. *Purple Granite* was essentially the same as *Short Granite* but with extra uranium-235 and an outer layer of aluminum.<sup>258</sup>

First off on 15 May was *Short Granite*. This was intended to be Britain's first detonation of a thermonuclear weapon. Unfortunately, *Short Granite* did not achieve the desired results and its initial estimated yield of 300 kt fell far short of the anticipated 1 Mt blast. Sixteen days later, *Orange Herald* was detonated with the estimated yield a much larger 720 kt, though it must be said that this design was a pure fission weapon as it was uncertain whether there had been any boosting effect at all or if the yield came from the fission of uranium-235.<sup>259</sup> On 19 June, *Purple Granite* was detonated and while operationally it was a success, the estimated yield was around 150 kt, roughly half of what *Short Granite* produced.<sup>260</sup> Overall, the *Grapple* trials were valuable but somewhat disappointing as none of the devices were able to achieve what was hoped.

Following closely behind the *Grapple* shots came the *Antler* series, followed by another series of *Grapple* tests in late 1957. There were three separate bomb designs that were potential test devices for *Grapple X*. It was eventually decided that Round A would be the first shot in the *Grapple X* series. On 8 November 1957, the Round A warhead, installed in a *Blue Danube* casing, was dropped from a Valiant bomber shortly after 08:46 local time and detonated at approximately 8000 feet above the surface of the ocean.<sup>261</sup> The estimated yield of *Grapple X* was 1.8 Mt, a figure that far exceeded the anticipated yield of 1 Mt.

The *Grapple X* shot was significant for two reasons; first it showed that Britain possessed the scientific expertise to develop a thermonuclear device capable of a blast in the megaton range. Second, it also showed that Britain was technologically able to develop an air-deliverable thermonuclear weapon. *Grapple X* was delivered by an RAF Valiant strategic bomber the primary component of Britain's strategic nuclear deterrent.<sup>262</sup> Britain had entered into the realm of thermonuclear weapons five years after their initial atomic detonation in 1952. Further tests occurred in April 1958 – *Grapple Y* – and the final British-only thermonuclear test *Grapple Z* occurred in

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<sup>258</sup> Ibid., 143-146.

<sup>259</sup> Ibid., 147.

<sup>260</sup> Ibid.

<sup>261</sup> Ibid., 159-160.

<sup>262</sup> See Air Vice Marshal Wilfrid E. Oulton, *Christmas Island Cracker: An Account of the Planning and Execution of The British Thermo-Nuclear Bomb Tests, 1957* (London: Thomas Harmsworth, 1987).



September 1958, with shots on the 2<sup>nd</sup> and 11<sup>th</sup> of the month. From this point forward, there would be no more British-only nuclear tests.<sup>263</sup> As John Walker explains,

Grapples X and Y put the UK well down the road to meeting its nuclear defence requirements. There were further developments and improvements that still needed to be made in UK design capabilities, irrespective of the promise of US information, which finally became a reality in the late summer and early autumn of 1958.<sup>264</sup>

The final few *Grapple* tests helped convince the Eisenhower administration that Britain did indeed deserve their seat at the head table and were worthy of renewed scientific and military cooperation. On 30 June 1958, US Congress approved changes to the Atomic Energy Act, which permitted technical cooperation between the US and UK. This culminated in the 4 August 1958 *Agreement for Co-operation on the Uses of Atomic Energy for Mutual Defence Purposes*. After twelve years of frustration, the special relationship had been reestablished. In the words of Edward Teller, “it was plain that the laws of physics operated on both sides of the Atlantic.”<sup>265</sup>

**TABLE 3. TIME BETWEEN FIRST ATOMIC AND THERMONUCLEAR TESTS**

USA	<i>Trinity to Bravo</i>	103 months
USSR	<i>Joe 1 to Joe 19</i>	75 months
UK	<i>Hurricane to Grapple X</i>	61 months

Source: Lorna Arnold, *Britain and the H-Bomb* (Basingstoke: Palgrave, 2001), 223.

**TABLE 4. TIME FROM INITIAL DECISION TO FIRST THERMONUCLEAR TEST**

USA	Presidential directive to <i>Bravo</i>	49 months
UK	Cabinet decision to <i>Grapple X</i>	39 months

Source: Lorna Arnold, *Britain and the H-Bomb* (Basingstoke: Palgrave, 2001), 223.

### CABINETS AND COMMITTEES

The UK case study is a straightforward example of how different governments make nuclear, biological and chemical weapons decisions. With a parliamentary system

<sup>263</sup> See Appendix 5 for a complete list of British nuclear tests up to and including 1958.

<sup>264</sup> John R. Walker, *British Nuclear Weapons and the Test Ban: 1954-1973* (Farnham: Ashgate, 2010), 90.

<sup>265</sup> Peter Hennessy, *Cabinets and the Bomb* (Oxford: Oxford University Press, 2007), 124, note 72.

that dates back well over four centuries, major policy decisions are taken in a very specific, formalized manner. Much has been written on how the British government, specifically the Cabinet, functions.<sup>266</sup> Cabinet and other committees are important components of the policy process. Committees are the lifeblood of government. Many important policy issues are referred to specific committees, either appointed by the Prime Minister or by the Cabinet. These committees are sometimes broken down into smaller subcommittees, which can exist for brief periods, usually to debate a specific policy issue. The Committee of Imperial Defence, Subcommittee on Bacteriological Warfare is an example. This subcommittee was, as Brian Balmer explains, “the key interface between biowarfare scientists and policy-makers.”<sup>267</sup> Since the understanding of the potential to use biological agents as weapons of war was in its infancy in the 1930s, these committees were invaluable in presenting policy-makers with up to date information on R&D efforts. The following section will provide a look at how the decision to develop an independent nuclear weapons programme was made. The focus on nuclear weapons is due to time constraints and general availability of primary sources.<sup>268</sup>

### *British Bureaucratic Politics*

When the Labour Party won the 1945 British General Election, the atomic bombings of Japan were a few months away. British involvement in the creation of the first atomic weapon was extensive and vital to the ultimate success of the project. Many key Manhattan Project scientists were British-based and had begun work on atomic issues at the outbreak of the Second World War. Unfortunately from a British perspective, the goodwill shared between the wartime allies was relatively short lived. The 1946 Atomic Energy Act signalled the end of nuclear cooperation and presented the Attlee government with a considerable decision; should Britain develop its own

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<sup>266</sup> See, Martin Burch and Ian Holliday, *The British Cabinet System* (London: Prentice Hall, 1996); Peter Hennessy, *Cabinet* (Oxford: Basil Blackwell, 1986); Simon James, *British Cabinet Government* (London: Routledge, 2002); Dennis Kavanagh, *British Politics: Continuities and Change* (Oxford: Oxford University Press, 2000); J. P. Mackintosh, *The British Cabinet* (London: Stevens & Sons, 1977); Philip Norton, *Does Parliament Matter?* (New York: Harvester Wheatsheaf, 1993); David Reynolds, *Britannia Overruled: British Policy and World Power in the Twentieth Century* (Harlow: Pearson Education, 2000); *British Government and Politics Since 1945*, ed. F. F. Ridley and Michael Rush. (Oxford: Oxford University Press, 1995); P. G. Walker, *The Cabinet* (London: Jonathan Cape, 1970); K. C. Wheare, *Government by Committee: An Essay on the British Constitution* (Oxford: Clarendon Press, 1955).

<sup>267</sup> Balmer, *Britain and Biological Warfare*, 12.

<sup>268</sup> See pages 172-177 in Chapter 5 for a look at cabinet/committee CBW decision-making in the 1963 decision.

independent nuclear weapons programme? To debate this singular issue, Prime Minister Clement Attlee created a small committee of ministers, named GEN 75. As Margaret Gowing explains, “Committees of ministers who gather together for certain *ad hoc* purposes are given GEN numbers; although they have a formal secretariat and formal circulation of papers, their existence and functions are not included in committee books and organization charts.”<sup>269</sup>

Committees are a standard component of the Whitehall parliamentary system. Issues that are deemed too sensitive or secretive for general debate are frequently referred to committees. GEN 75 was an *ad hoc* ministerial committee where a small group of ministers met to discuss atomic energy and the development of a British atomic weapon. This is in slight contrast to official committees where informed civil servants take part in the debate of the issue(s) in question. In August 1946 the Atomic Energy Official Committee was set up to “consider questions in the field of atomic energy which call for discussion between departments.”<sup>270</sup> The Committee consisted of the representatives of the Chiefs of Staff Secretariat, the Foreign Office, the Treasury, the Dominion Office and the Ministry of Supply.<sup>271</sup>

The atomic bomb question was initially debated by a small number of individuals within GEN 75.<sup>272</sup> Since the decision to develop an independent nuclear weapons programme was of vital importance, it was in the government’s best interest to keep the circle small. Attlee was reluctant, much in the same way Churchill was, to bring the full Cabinet into atomic discussions. Gowing states that, “During the six years of Mr. Attlee’s Government atomic energy or bombs appeared less than ten times on the agenda of Cabinet meetings” and “half these appearances – five – were in the first six months of the period.”<sup>273</sup> Attlee, as well as some of his closest colleagues, were of the opinion that the British public “know as little as possible lest an enemy learn even more.”<sup>274</sup> On 28 August a memorandum from the Prime Minister outlined the necessity of developing major policy regarding the atomic bomb.<sup>275</sup> As Peter Hennessey explains:

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<sup>269</sup> Gowing and Arnold, *Independence and Deterrence, Volume I*, 21.

<sup>270</sup> *Ibid.*, 29-30.

<sup>271</sup> *Ibid.*

<sup>272</sup> The first meeting of this committee was attended by Attlee, Herbert Morrison (Lord President of the Council), Ernest Bevin (Foreign Secretary), Sir Stafford Cripps (President of the Board of Trade), Sir Edward Bridges (Secretary to the Cabinet), Sir Ronald Campbell (Assistant Under Secretary of State, Foreign Office) and D. H. P. Rickett (Secretary). GEN 75 1<sup>st</sup> Meeting, 11 August 1945. TNA CAB 130/2.

<sup>273</sup> Gowing and Arnold, *Independence and Deterrence, Volume I*, 19-20.

<sup>274</sup> *Ibid.*, 51.

<sup>275</sup> Memorandum by the Prime Minister – The Atomic Bomb, GEN 75/1, 28 August 1945. TNA CAB 130/3.

Attlee and his inner group of atomic-primed ministers pursued a twin-track approach. Hopes still existed for an international agreement through the proposed United Nations Atomic Energy Commission. But at the same time, GEN 75 began work of creating a UK capacity to make a bomb by authorizing funds for the construction of a plutonium pile in Cumberland as a matter of the highest urgency and importance.<sup>276</sup>

Bureaucratic pulling and hauling was evident during the discussions leading up to the decision to develop an independent nuclear weapons programme. During the fifteenth meeting of GEN 75 on 25 October 1946, President of the Board of Trade, Sir Stafford Cripps and Chancellor of the Exchequer Hugh Dalton had voiced the greatest opposition against the creation of an independent British nuclear weapons programme. There was a proposal tabled to pursue a preliminary design for the construction of a gaseous diffusion plant for the production of Uranium 235.<sup>277</sup> The Minister of Supply, John Wilmot, estimated the cost to be between £30-40 million, spread over a period of four to five years.<sup>278</sup> Both Cripps and Dalton expressed their concerns over the perceived high cost of the proposal. The minutes of the meeting recorded their doubts:

In discussion it was argued that we must consider seriously whether we could afford to divert from civilian consumption and the restoration of our balance of payments, the economic resources required for a project on this scale. Unless present trends were reversed we might find ourselves faced with an extremely serious economic and financial situation in two to three years time.<sup>279</sup>

Cripps and Dalton presented a convincing argument based on what they thought was sound economic pragmatism. The tone of the meeting changed once Foreign Secretary and influential trade unionist Ernest Bevin entered into the debate. Bevin was a man of enormous personality and personal conviction. The official meeting minutes recorded his thoughts on the matter as:

On the other hand it was argued that we could not afford to be left behind in a field which was of such revolutionary importance from an industrial, no less than from a military point of view. Our prestige in the world, as well as our chances of securing American co-operation would both suffer if we did not exploit to the full a discovery in which we had played a leading part at the outset. The development of a new source of industrial power might strengthen our industrial position very considerably in the

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<sup>276</sup> Hennessy, *Cabinets and the Bomb*, 39.

<sup>277</sup> Cabinet, Atomic Energy, Minutes of GEN 75, 15<sup>th</sup> Meeting, 25 October 1946. TNA CAB 130/2.

<sup>278</sup> Ibid.

<sup>279</sup> Ibid.

future, particularly at a time when it was becoming more and more difficult to find labour for coal mining.<sup>280</sup>

According to Sir Michael Perrin, who was present at the meeting as a representative of the Ministry of Supply, the tenor of Bevin's thoughts and opinions were much more compelling. As Perrin recalls, Bevan stated:

No, Prime Minister, that won't do at all. We've got to have this. I don't mind for myself, but I don't want any other Foreign Secretary of this country to be talked at, or to, by the Secretary of State in the United States as I just have in my discussions with Mr. Byrnes. We've got to have this thing over here whatever it costs. We've got to have the bloody Union Jack on top of it.<sup>281</sup>

Bevin was ultimately successful in turning the discussion toward pursuing an independent nuclear programme. After this meeting, Lord Portal the Controller of Production of Atomic Energy, wrote a memo to Prime Minister Attlee, dated 31 December. In Portal's brief, he lays out three possible courses of action<sup>282</sup> that the government could take:

1. Not to develop the atomic weapon at all.
2. To develop the weapon by means of the ordinary agencies in the Ministry of Supply and the Service Departments.
3. To develop the weapon under special arrangements conducive to the utmost secrecy.

Attlee decided that the appropriate course of action regarding this brief would be to take it to committee. Since he was cautious of involving Dalton and Cripps, two of the GEN 75 dissenters, Attlee created a new committee, which met only once, on 8 January 1947. This British Cabinet Committee on Atomic Energy, recorded as GEN 163, included representatives from the Ministries of Supply, Defence, Dominion Affairs and Foreign Affairs. This meeting laid out the path to developing Britain's own nuclear weapons programme, under the guidance of William Penney.<sup>283</sup> May would see a plan to build two air-cooled reactors approved by the government. A month later Penney would be put in charge of the BHER programme. Under Penney, BHER was tasked with

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<sup>280</sup> Ibid.

<sup>281</sup> Sir Michael Perrin on BBC's *Timewatch*, 29 September 1982. Quoted in Hennessy, *The Secret State*, 48.

<sup>282</sup> Memorandum by the Minister of Supply, Note by the Controller of Production of Atomic Energy, 31 December 1946. TNA PREM 8/911.

<sup>283</sup> Cabinet, Atomic Energy, Minutes of GEN 163, 1<sup>st</sup> Meeting, 9 January 1947. TNA CAB 130/16.

developing Britain's atomic weapons programme, which was located at Woolwich Arsenal.<sup>284</sup>

Lord Portal and Foreign Secretary Bevin were strong supporters of Britain having an independent nuclear weapons programme. During the first (and only) meeting of GEN 163, Bevin was recorded as saying that:

We (Britain) should press on with the study of all aspects of atomic energy. We could not afford to acquiesce in an American monopoly of this new development. Other countries also might well develop atomic weapons. Unless therefore an effective international system could be developed under which the production and use of the weapon would be prohibited, we must develop it ourselves.<sup>285</sup>

The omission of Dalton and Cripps, two of the Cabinet's most senior economic politicians, from GEN 163 was significant, and as Peter Hennessy argues, "can only be explained by Attlee's determination that the decision should go through on the nod."<sup>286</sup> For a few individuals, like Bevin, prestige was an important factor. Britain had been involved in the comprehensive defeats of the Axis Powers in the Second World War and was keen to retain its status as a leading global player. Bevin's comments reflected this and it had resonated throughout the committee.

The decision to develop an independent nuclear weapons programme is a good example of bureaucratic politics at work. On the table was a significant policy decision that required debate at the highest levels of government. A small, *ad hoc* committee was created for this singular purpose.<sup>287</sup> Though the key players in the committee discussions were largely Labour Party politicians, there were competing interests between a few individuals. As highlighted, Hugh Dalton and Sir Stafford Cripps were two of the government's most senior economic politicians. They had very real concerns regarding the cost-benefit and viability of an independent nuclear programme, so close to the end of the Second World War, which had left Britain with a large debt and considerable payments to its wartime Allies. Bevin saw things differently. Outside of the Prime Minister, the Foreign Secretary had more contact with US officials than any

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<sup>284</sup> Cathcart, *Test of Greatness*, 48.

<sup>285</sup> Cabinet, Atomic Energy, Minutes of GEN 163, 1<sup>st</sup> Meeting, 9 January 1947. TNA CAB 130/16.

<sup>286</sup> Hennessy, *Cabinet*, 127.

<sup>287</sup> GEN 75 and GEN 163 were ministerial committees. These committees were comprised of government ministers with portfolios. As Lorna Arnold explains, "In February 1947, a proper ministerial committee – the AE(M) Committee – was set up to handle policy questions requiring the consideration of ministers, under the chairmanship of the Prime Minister, but it met infrequently and GEN Meetings, variously numbered, were still used to deal with the highest matters of policy." Arnold and Smith, *Britain, Australia and the Bomb*, 8.

other Cabinet member. The creation of the US Atomic Energy Act was a particularly sensitive issue for the British as many had felt betrayed by American refusals to share atomic secrets. Though both sides had the same political affiliations, they definitely saw this issue from different places. According to Morton Halperin, “participants usually do not see issues as arbitrary, and they tend to find strong grounds to favor one position.”<sup>288</sup>

Each individual in the decision to go nuclear had his own personal reasons, for or against. Graham Allison states that, “Individuals share power and they differ about what must be done. Differences matter.”<sup>289</sup> In this case the ministries that Dalton, Cripps and Bevin represented were all different and as Allison explains, “because their preferences and beliefs are related to the different organizations they represent, their analyses yield conflicting recommendations.”<sup>290</sup> Since Attlee was for the nuclear weapons programme, it made sense that he would decide not to include Dalton and Cripps in the reconvened GEN 163 committee for fear of having the process start over from the beginning.

The decision to develop an independent nuclear weapons programme, when viewed through the bureaucratic politics lens, provides a characteristic example of the “pulling and hauling” that is endemic to politics.<sup>291</sup> The bureaucratic politics model is only one of a number of means in approaching British decisions on nuclear, biological and chemical weapons. When used in a non-crisis situation and in examining a specific policy issue, in this case whether or not to develop an independent nuclear weapons programme, bureaucratic politics can provide an extra level of analysis that other decision-making models cannot. As we have seen, these types of decisions are not made because of one individual’s personal bias. Within the Cabinet, decisions on NBC weapons were referred to small standing or *ad hoc* committees for discussion and debate. While the Prime Minister is ultimately responsible for taking the decision, but that is not before multiple levels of discussion and analysis by political figures, scientists and military personnel. Bureaucratic politics has ultimately proven to be a

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<sup>288</sup> Morton H. Halperin, *Bureaucratic Politics and Foreign Policy* (Washington: The Brookings Institute, 1974), 20.

<sup>289</sup> Graham T. Allison and Philip Zelikow, *Essence of Decision: Explaining the Cuban Missile Crisis* (New York: Longman, 1999), 256.

<sup>290</sup> Ibid.

<sup>291</sup> Graham T. Allison and Morton H. Halperin, “Bureaucratic Politics: A Paradigm and Some Policy Implications,” *World Politics*, Volume 24 (Spring 1972): 43.

useful tool in looking at the British government's decisions to develop nuclear, biological and chemical weapons.

## CONCLUSION

This case study was intended to provide an in-depth look at the British government's decisions to develop NBC weapons, in order to understand the connections between nuclear weapons on the one hand and chemical and biological weapons on the other. The Second World War was a significant factor in Britain's decisions to develop a non-conventional weapons capability. During the Second World War some influential members of the government saw the development of an atomic weapon as a necessary component of their war effort against the Axis powers. At this time British thinking was influenced by the belief that Germany might be conducting research into the possibility of using nuclear fission to create atomic bombs. Since the United States was not actively involved in combat operations at this point, the Roosevelt administration did not view nuclear technology the same way the British did. American interests eventually shifted to investigating the feasibility of developing atomic weapons on 18 December 1941, nine days after the Japanese attack that crippled the US Pacific Fleet at Pearl Harbour, Hawaii. This sentiment was not as widely accepted in the United States as it was in the UK, as nuclear weapons were thrust into the forefront of weapons technology beginning in 1945. Believing that the Soviet Union was close to developing a thermonuclear device, Senator Brien McMahon, Chairman of the Joint Committee on Atomic Energy, had pressed President Harry Truman into committing to the mass-production of H-bombs, thereby making it the United States' primary weapon. The atomic bomb came to occupy a central role in US military strategy, while the deployment of B-29's to Britain signified an American nuclear commitment to the defence of Western Europe.

This desire to impress the US was significant within both the Churchill and Attlee governments.<sup>292</sup> There was a strong belief within Attlee's Cabinet that they needed to have a nuclear capability to earn American respect and cooperation in political and military affairs.<sup>293</sup> The US had a nuclear monopoly until 1949 when the Soviet Union detonated its first atomic weapon. As John Simpson explains, "What

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<sup>292</sup> Interview with Lorna Arnold, 5 September 2008.

<sup>293</sup> GEN 75, Minutes of the 15<sup>th</sup> Meeting on Friday 25 October 1946. TNA CAB 130/2.



complicates this from 1948 onwards is that at heart the British did not actually want to make nuclear weapons but what they ideally wanted was to get back to the relationship they had with the USA during the war and to therefore have access to US weapons but not necessarily to make them themselves.”<sup>294</sup> While the declared motive was security and the defence of Britain, reestablishing the relationship with the US was a key factor in the British decision to go for nuclear weapons.<sup>295</sup> The desire to impress the US was very strong and that an independent nuclear weapons programme was necessary in order to earn American respect and cooperation in military and political matters.<sup>296</sup> British reasoning was much more complex than the declared purpose of national security and defence of the realm.

Chemical weapons had been used extensively in the First World War. All sides knew the military utility of the early types of chemical agents. Advances in chemistry had created a new and highly potent family of nerve agents in the late 1930s and early 1940s, known as the G-agents. The V-agents were a new type of CW that was discovered in the 1950s, and their creation necessitated a rethink of the role that chemical weapons would play in British strategic planning. In the postwar period, the concept of retaliation-in-kind became part of the accepted language for addressing adversity.<sup>297</sup> The Soviet Union had supplanted Nazi Germany as the West’s pre-eminent enemy and the assumption was that the Soviets were conducting research into different types of non-conventional weapons.<sup>298</sup> It remained in Britain’s best interest to do the same, lest they be left without the ability to retaliate.

Very little was known about how best to use biological agents as weapons, during the early years of British interest in BW. Again, during the Second World War, there were concerns that Germany was actively pursuing research into biological warfare agents. At the time Britain had tested anthrax biological bombs on Gruinard Island as well as having developed anthrax cattle cakes. Effort was put into developing

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<sup>294</sup> Interview with John Simpson, 6 August 2008.

<sup>295</sup> Interview with Lorna Arnold, 5 September 2008.

<sup>296</sup> Gowing and Arnold, *Independence and Deterrence, Volume I*, 122-123; Interview with Lorna Arnold, 5 September 2008.

<sup>297</sup> The BW Subcommittee concluded in a report dated 10 May 1948 that, ‘we must also be free to conduct research in the offence in order to possess the power of launching reprisals in kind. Chiefs of Staff Committee, Biological Warfare Sub-Committee, Atomic Energy Commission – Biological Warfare, Report to the Chiefs of Staff, 10 May 1948, DW (48) 9(0) (Final). TNA WO 188/662; Ministry of Defence, Defence Research Policy Committee, BW Policy, Memorandum by the Chairman, BW Sub-Committee, DRP (50) 53, 11 May 1950. TNA DEFE 10/26; Chemical Warfare Policy, CMS 948, August 1949. TNA AIR 20/11353; Policy for Chemical Warfare, D (53) 17, 25 March 1953. TNA DEFE 13/265.

<sup>298</sup> See pages 59-60, notes 64 and 65.

a biological weapon “comparable in strategic effect with the atomic bomb, and defensive measures against them.”<sup>299</sup> After the *Hurricane* test in 1952, interest in offensive BW had begun to drift, as Brian Balmer explains, “in an ambiguous and ambivalent manner... in the direction of defensive in preference to offensive priorities.”<sup>300</sup> This eventually culminated in the Eden government’s cancellation of the offensive chemical and biological weapons programmes in July 1956.

As demonstrated in this case study, having a non-conventional weapons capability – especially nuclear weapons – for the purpose of use in war is not always a state’s ultimate goal. These weapons are intrinsically connected to each other on multiple levels, such as financial constraints, resource allocation/competition and thoughts on national defence and regional security.

Bureaucratic politics provides a useful theoretical perspective when looking at how a state like the UK decides to embark upon developing NBC weapons programmes. The example of the GEN 75 committee debates highlights the manner in which these decisions are taken. In this particular case, the decision to develop an independent nuclear weapons programme was deliberate and pragmatic. A particular issue needed to be discussed at the highest levels of government and a decision to develop or not develop a nuclear weapons programme had to be taken. Individual personalities were influential in determining the final decision. Not that there were competing interests in that different proposal for weapons development were put forth, merely competing interests between government ministries. In the end it came down to the belief that it was in Britain’s best interest to try and reestablish the special relationship with the United States – a relationship that had suffered somewhat since the end of the Second World War. As C. J. Bartlett explains, “Thus at the end of the war, both in the United States and in Britain, there was a definite loosening of the relationship. It was understandable that the government of each should have tried to reappraise its policies and priorities, and been anxious to explore its range of options.”<sup>301</sup> The relationship was eventually reestablished and Britain had successfully demonstrated its scientific and technical abilities in nuclear, biological and chemical weapons R&D to be of the highest calibre.

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<sup>299</sup> Defence Research Policy Committee, Final Version of a Paper on Future of Defence Research Policy, 30 July 1947. TNA DEFE 10/19.

<sup>300</sup> Balmer, *Britain and Biological Warfare*, 128; Carter, *Chemical and Biological Defence at Porton Down*, 79.

<sup>301</sup> C. J. Bartlett, *The Special Relationship: A Political History of Anglo-American Relations Since 1945* (London: Longman Group UK, 1992), 10.

## CHAPTER 4

### IRAQ

We shall use the weapons that will be equatable  
to weapons used against us by our enemies.<sup>1</sup>

- Saddam Hussein, 28 January 1991

The area that comprises modern day Iraq (Mesopotamia) has been commonly referred to as the cradle of civilization. In approximately the seventh millennium BCE, the practice of intensive year round agriculture began. This created a continual supply of food and eliminated the need for people to migrate to other food sources, which helped to create some of the earliest known permanent settlements.<sup>2</sup> The Tigris and Euphrates rivers provided a rich, fertile soil and a supply of fresh water for the irrigation of agricultural crops. Eventually many civilizations would flourish including Sumer, Akkad, Assyria and Babylonia. There were many notable accomplishments during this time including the creation of irrigation agriculture, development of roads, the invention of the wheel and many achievements in astronomy, mathematics, medicine, architecture and philosophy.<sup>3</sup> This would continue on throughout the centuries, from the Bronze Age through the Islamic conquest in the seventh century, to the establishment of the British Mandate of Mesopotamia in 1920, which led to the eventual creation of an independent Iraq in 1932.<sup>4</sup>

The following decades saw a number of *coups d'état* occur inside Iraq. The first occurred on 14 July 1958 and was led by Army Colonel 'Abd al-Salam 'Arif and Brigadier General 'Abd al-Karim Qasim.<sup>5</sup> This violent and bloody affair effectively ended the rule of the Hashemite Monarchy and instilled Qasim as Prime Minister. The next *coup d'état* occurred on 8 February 1963 when forces loyal to the newly established Ba'th Party seized a number of military installations in and around Baghdad, resulting in the deaths of up to 5000 people.<sup>6</sup> This event culminated in the capture and

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<sup>1</sup> "Account of Saddam Interview," *Washington Post*, 29 January 1991, A10 & A12.

<sup>2</sup> The ancient site of Qal'at Jarmo (Jarmo), thought to be the oldest agricultural settlement known. First excavated by Professor Robert Braidwood in 1948, it is believed that Jarmo was settled in approximately 6500 BCE. Georges Roux, *Ancient Iraq* (London: George Allen & Unwin, 1964), 51.

<sup>3</sup> Geoff Simons, *Iraq: From Sumer to Saddam* (Basingstoke: Macmillan, 1994), 116-138.

<sup>4</sup> Peter Sluglett, *Britain in Iraq: Contriving King and Country, 1914-1932* (London: Ithaca Press, 1976), 3.

<sup>5</sup> Charles Tripp, *A History of Iraq* (Cambridge: Cambridge University Press, 2007), 144.

<sup>6</sup> Efraim Karsh and Inari Rautsi, *Saddam Hussein: A Political Biography* (London: Brassey's, 1991), 22.

execution on 9 February of General Qasim and his colleagues and the establishment of 'Abd al-Salam 'Arif as president with Ahmad Hassan al-Bakr as vice-president.<sup>7</sup> November of that same year saw the Ba'th Party torn apart by a bitter ideological struggle between rival internal factions. On one side a leftist, militant group headed by Ba'th Party Secretary-General Ali Salih al-Sa'di and on the other a right-wing group led by Commander of the Air Force General Hardan al-Tikriti.<sup>8</sup> On 11 November the leftist group was expelled from the party and al-Sa'di and four of his closest associates were arrested. The following day the members of the right-wing faction were removed from the party by the National Command. This allowed President Arif to turn against the very people who promoted him to Ba'th Party leadership and prevent the remaining Ba'th Party leaders from achieving positions of power.

After the problems of November 1963, the Ba'th Party was thrown into disarray. Emerging from this as the dominant force was a group of men loyal to Ahmad Hassan al-Bakr. In 1964 al-Bakr was elected to the newly formed National Council of the Revolutionary Command (NCRC) and a year later Saddam Hussein Abd al-Majid al-Tikriti's selection was confirmed as well.<sup>9</sup> According to Charles Tripp, the NCRC was comprised of twelve Ba'thist and four Arab nationalist members. This group exercised supreme power, and had some of its members part of the, "formal apparatus of government."<sup>10</sup> This regime was to be relatively short lived.

On 17 July 1968, units loyal to the Ba'th Party seized Broadcasting House, the Ministry of Defence as well as Republican Guard headquarters.<sup>11</sup> As buildings in Baghdad fell to Ba'th forces on 30 July, President Arif was flown out of the country to Morocco. He was 'appointed' ambassador, but this was merely window dressing, as it was widely believed that he would mount a counter-coup against the al-Bakr bloc. This event ended his tenure as Iraq's President and saw the reestablishment of Ba'thist rule, with Ahmad Hassan al-Bakr as president and Saddam Hussein as his second-in-command.<sup>12</sup> On 16 July the following year, Ahmad Hassan al-Bakr announced his resignation as President of Iraq.<sup>13</sup> Hours later General Saddam Hussein was sworn in as his replacement, completing his relatively rapid rise to the apex of power. For years

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<sup>7</sup> Tripp, *A History of Iraq*, 164.

<sup>8</sup> Karsh, *Saddam Hussein*, 22-23.

<sup>9</sup> Will be referred to as Saddam Hussein.

<sup>10</sup> Tripp, *A History of Iraq*, 164.

<sup>11</sup> Ibid., 184.

<sup>12</sup> Ibid., 185.

<sup>13</sup> The official explanation for al-Bakr resigning was due to poor health. Simons, *Iraq*, 283.

Hussein was seen as one of al-Bakr's most trusted lieutenants and his thirst for power was known throughout Iraq. Charles Tripp in *The History of Iraq* states that his power grab was "symbolically charged and that the speed of the operation showed that Saddam Hussein would take no chances in allowing opposition to his personal rule to crystallize."<sup>14</sup> He would continue to operate in much the same capacity up to the 2003 Invasion of Iraq and his subsequent capture by the 1st Brigade Combat Team of the 4th Infantry Division, United States Army on 13 December 2003.<sup>15</sup>

Politicians, senior technocrats and scientists, military personnel, government officials and even family members were not immune to Saddam's ruthless form of autocracy.<sup>16</sup> No one was considered untouchable. Nothing was sacrosanct. If it were thought that you had done something that was perceived to not be in the best interest of the regime, you would be dealt with in a swift and often brutal manner. This frequently meant jail time, and for many a fate much worse. Saddam nurtured his aura of fear and reward and he understood people at their basest levels.<sup>17</sup> Former nuclear weapons scientist Mahdi Obeidi said that Saddam's "culture of intimidation was almost mystical."<sup>18</sup> People understood that they could be either horribly punished for something or handsomely rewarded with houses, Mercedes-Benz cars or cash.

Iraqi interest in nuclear, biological and chemical weapons predates Saddam Hussein's 1979 ascent to power. Throughout the second half of the twentieth century, successive Iraqi governments had shown interest in NBC technology. Iraq's nuclear programme dates back to 1956 with the creation of the Iraqi Atomic Energy Commission (IAEC). The IAEC fell under the auspices of the newly created Atoms for Peace Program, which sought the peaceful development of nuclear energy.<sup>19</sup> The IAEC was established with US help and encouragement in order to foster and conduct

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<sup>14</sup> Tripp, *A History of Iraq*, 214.

<sup>15</sup> "Saddam Hussein: A Dictator Fallen." Military.com, accessed 22 April 2009, [http://www.military.com/NewContent/0,13190,GH\\_Saddam,00.html](http://www.military.com/NewContent/0,13190,GH_Saddam,00.html).

<sup>16</sup> Barzan Ibrahim Hasan Al-Tikriti (half-brother) was arrested and placed under house arrest in 1974 and Saddam's eldest son Uday Saddam Hussein was arrested, jailed and eventually exiled to Switzerland for the public murder of Saddam's official food taster as well as the murder of Hussein Kamel upon his return to Iraq after fleeing to Jordan in 1995. Karsh and Rautsi, *Saddam Hussein*, 181-185.

<sup>17</sup> Interview with Charles Duelfer, 10 April 2008.

<sup>18</sup> Mahdi Obeidi and Kurt Pitzer, *The Bomb in My Garden: The Secrets of Saddam's Nuclear Mastermind* (Hoboken: John Wiley, 2004), 9.

<sup>19</sup> "The Eisenhower Presidency, 1953 – 1961, Administration Facts." The Eisenhower Presidential Library and Museum, accessed 15 April 2009, [http://eisenhower.archives.gov/All\\_About\\_Ike/Presidential/Presidential.html](http://eisenhower.archives.gov/All_About_Ike/Presidential/Presidential.html).

research, development and training in nuclear science and technology.<sup>20</sup> The early 1960s saw a number of Iraqi military officers sent abroad for training in nuclear, biological and chemical defence, which culminated in the formation of the Iraqi Chemical Corps in 1964.<sup>21</sup> The events of the following decade and the perceived dual threats of Israel and Iran would see Iraq pour massive amounts of money and resources into their NBC weapons programmes. It is through this lens that I examine Saddam Hussein, Iraq, the decisions to pursue nuclear, biological and chemical weapons and the connections between the programmes.

### THE NUCLEAR WEAPONS PROGRAMME

Iraq's interest in nuclear energy was formalized with the creation of the IAEC in 1956. This does not mean that Iraq's goal at the time was the creation of a full-scale nuclear weapons programme. Certain things need to be established well before any substantial weapons development can take place. The establishment of the IAEC was the first in a long line of decisions that were crucial to Iraq developing a nuclear weapons programme. Three years later, 375 Iraqi university students were sent to the Soviet Union to study nuclear technology.<sup>22</sup>

During the rule of the Hashemite monarchy, Iraqi Prime Minister Nuri as-Sa'id had cultivated close ties with western powers, believing that they were the key players in guaranteeing the existence of the monarchy.<sup>23</sup> This all changed after the coup with Abd al-Karim Qasim as Prime Minister. Friendly relations with the Soviet Union were established and Iraq's relationships with the US and UK suffered as a result. While a staunch anti-Communist, Qasim nevertheless saw the USSR as a chief source of diplomatic, economic and military support.<sup>24</sup> This is further evidenced by the sale of a 2-megawatt thermal (MWth) research reactor, IRT-5000 supplied by the Soviets in 1962. The Tuwaitha site, located about thirty kilometres south of Baghdad, became the Nuclear Research Center after it was chosen as the location of the Soviet-supplied

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<sup>20</sup> Khidhir Hamza with Jeff Stein, *Saddam's Bombmaker: The Daring Escape of the Man Who Built Iraq's Secret Weapon* (New York: Scribner Press, 2000), 69.

<sup>21</sup> Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD – 30 September 2004 Volume III, 5. Will heretofore be referred to as ISG Report.

<sup>22</sup> "Iraq Profile – Nuclear." Nuclear Threat Initiative, accessed 11 March 2009, [http://www.nti.org/e\\_research/profiles/Iraq/Nuclear/2121.html](http://www.nti.org/e_research/profiles/Iraq/Nuclear/2121.html).

<sup>23</sup> Tripp, *A History of Iraq*, 134.

<sup>24</sup> Ibid, 158.

reactor and its associated facilities.<sup>25</sup> According to Khidhir Hamza, when the Kennedy administration learned that the USSR was supplying a research reactor to Iraq, they offered to supply an American one, which was refused due to a strong pro-communist faction within the government.<sup>26</sup>

The IRT-5000 reactor went critical in 1967 and began operating at full power the following year.<sup>27</sup> According to the IAEA, the reactor was used primarily for, “radioisotope production and as a neutron source for experimental research in the field of nuclear and solid state physics and activation analysis.”<sup>28</sup> This was a significant date in the chronology of events of the nuclear programme as it marks the beginning of dedicated nuclear research in Iraq.<sup>29</sup> Another important event took place on 1 July 1968 with Iraq signing the Nuclear Nonproliferation Treaty.<sup>30</sup> On 29 October 1969 Iraq ratified its signature of the NPT, thereby pledging to pursue nuclear energy for peaceful purposes and to not develop nuclear weapons.<sup>31</sup> Though safeguards had been in place since 1961 it was not until 1972 and the adoption of IAEA INFCIRC/153 that the provision for safeguards inspections would come into force.<sup>32</sup> This was significant as it meant that IAEA safeguards inspectors were permitted to inspect a signatory states’ nuclear facilities every six months. Once Iraq had joined the NPT it would be subject to the same intrusive inspection mechanisms that all states parties were subjected to, other than the five recognized nuclear weapon states. In theory it meant that attempts at nuclear subterfuge would be more difficult. However, this proved not to be the case, as Iraq would ignore its treaty obligations and begin the process of developing a nuclear weapon.

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<sup>25</sup> David Albright, Corey Gay and Khidhir Hamza, “Development of the Al-Tuwaitha Site: What if the Public or the IAEA Had Overhead Imagery?” Institute for Science and International Security, accessed 29 March 2009, <http://www.isisonline.org/publications/iraq/tuwaitha.html>.

<sup>26</sup> Hamza with Stein, *Saddam's Bombmaker*, 69.

<sup>27</sup> “IRT 5000 Reactor.” International Atomic Energy Agency, accessed 15 April 2009, <http://www-ns.iaea.org/projects/iraq/tuwaitha/irt5000.asp>.

<sup>28</sup> Ibid.

<sup>29</sup> “Iraq's Nuclear Weapons Program: From Aflaq to Tammuz.”

<sup>30</sup> “Treaty on the Non-Proliferation of Nuclear Weapons.” United Nations, accessed 11 April 2009, <http://disarmament.un.org/TreatyStatus.nsf>.

<sup>31</sup> “NPT Signatory States: Iraq.” The United Nations, accessed 22 March 2009, [http://disarmament.un.org/TreatyStatus.nsf/NPT%20\(in%20alphabetical%20order\)?OpenView&Start=1.58](http://disarmament.un.org/TreatyStatus.nsf/NPT%20(in%20alphabetical%20order)?OpenView&Start=1.58).

<sup>32</sup> See “INFCIRC/26, 30 March 1961.” International Atomic Energy Agency, accessed 6 May 2011, <http://www.iaea.org/Publications/Documents/Infcircs/Others/infcirc26.pdf>; “INFCIRC/66/Rev.2, 16 September 1968.” International Atomic Energy Agency, accessed 6 May 2011, <http://www.iaea.org/Publications/Documents/Infcircs/Others/infcirc66r2.pdf>; “INFCIRC/153 (Corrected), June 1972.” International Atomic Energy Agency, accessed 6 May 2011, <http://www.iaea.org/Publications/Documents/Infcircs/Others/infcirc153.pdf>.

### *Expansion*

The decade of the 1970s would see the greatest expansion of the nuclear programme. Early in 1970, the Tuwaitha facility underwent a substantial expansion that saw it grow to include a number of buildings, including an isotope production laboratory, power substation, workshop, physics and chemistry laboratories, and expanded office space for the Nuclear Research Center. The number of personnel also expanded from a few dozen to a few hundred.<sup>33</sup> According to Khidhir Hamza, “in 1971 orders were given by Saddam Hussein to begin the process of creating a nuclear weapon.”<sup>34</sup> This was eventually developed into a comprehensive plan for developing nuclear weapons in the form of a 40-page report, co-authored by Hamza and others. The plan called for acquiring a medium-sized research reactor from the French, to be concealed under the guise of a civilian nuclear programme. The plan also called for a clandestine reprocessing unit, which is necessary to separate the plutonium. The report was reviewed by a group affiliated with the Revolutionary Council and was ultimately approved by Saddam himself.<sup>35</sup>

The locus of Hamza's plan was the acquisition of a foreign reactor for producing plutonium. His goal was to acquire a complete, safeguarded fuel cycle able to produce separated plutonium and duplicate the facilities clandestinely in order to produce non-safeguarded plutonium, which could be diverted towards a nuclear bomb.<sup>36</sup> On 29 February 1972, in accordance with Article III of the NPT, Iraq agreed to accept IAEA safeguards. The agreement was designed to monitor and prevent Iraqi fissionable material from being diverted towards a nuclear weapons programme.<sup>37</sup> The following year French Prime Minister Jacques Chirac and Saddam Hussein reached an agreement in which France provided Iraq with a nuclear reactor in exchange for petroleum concessions, imports of French automobiles, and options on future military aircraft purchases.<sup>38</sup> Saddam would eventually gain control of Iraq's nuclear programme when in late 1973 oversight of the IAEC was transferred to the Revolutionary Council.<sup>39</sup> This

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<sup>33</sup> Albright, Gay and Hamza, “Development of the Al-Tuwaitha Site.”

<sup>34</sup> Hamza with Stein, *Saddam's Bombmaker*, 333.

<sup>35</sup> Ibid, 70.

<sup>36</sup> Albright, Gay and Hamza, “Development of the Al-Tuwaitha Site.”

<sup>37</sup> “INFCIRC/172, 22 February 1973.” International Atomic Energy Agency, accessed 11 March 2009, <http://www.iaea.org/worldatom/Documents/Infocircs/Others/infcirc172.pdf>.

<sup>38</sup> Hamza with Stein, *Saddam's Bombmaker*, 81.

<sup>39</sup> From 1973 to 1979, he also served as President of the IAEC and sponsored its acquisition of foreign-supplied facilities with which to support a nuclear weapons program. ISG Report, II, Nuclear Programme, 3.



was a key moment in the development of Iraq's nuclear programme. Though he understood very little of the science behind the nuclear process, he was nevertheless an ardent supporter of the programme. He would make sure that the programme was well-funded and provided massive incentives and disincentives for all those involved. People knew that refusal to cooperate in the clandestine weapons programme would be viewed negatively by the regime. Saddam took it as a personal affront of his authority if someone refused to assist in developing the programme. This created a level of tension that would persist until the end of Operation *Desert Storm*.

When the Hashemite monarchy was overthrown in 1958, political and economic cooperation with the West began to suffer – the notable exception being France – and the USSR became one of Iraq's principal financiers. In June 1974, a delegation from the IAEA, including Khidhir Hamza, Ja'far Diya' Ja'far, and Hussein al-Shahristani, travelled to Paris to negotiate the purchase of a nuclear reactor based on the French-designed Osiris reactor.<sup>40</sup> After considerable negotiations, the total cost for the entire reactor package came to approximately \$300 million.<sup>41</sup> Interestingly, this was nearly double the initial estimate originally given by the French. The following year, on 10 September, Saddam Hussein travelled to Paris to meet with French Prime Minister Jacques Chirac where he intended to negotiate the export of the two Tammuz research reactors.<sup>42</sup> Hussein would leverage the deal with sales of discounted Iraqi oil to the French. Iraq eventually purchased a 40 MWth nuclear materials testing reactor (MTR) from France. This reactor would be known as Tammuz-1 or Osirak.<sup>43</sup> The collaboration with France was an important period for Iraq's nuclear programme. The French had little problem receiving Iraqi oil in return for nuclear materials. It seemed that Iraq had found a partner willing to assist them in their quest to develop a civil nuclear energy programme and ultimately, a clandestine nuclear weapons programme.

### *Enrichment Programmes*

On 7 June 1981, fourteen Israeli jets destroyed Tammuz-1 in Operation *Babylon*. The smaller Tammuz-2 (Isis) reactor, the 600-kilowatt thermal (kWth) critical assembly

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<sup>40</sup> "Iraq's Nuclear Weapons Program: From Aflaq to Tammuz."

<sup>41</sup> Ibid.

<sup>42</sup> Hamza with Stein, *Saddam's Bombmaker*, 105.

<sup>43</sup> "Iraq's Nuclear Weapons Program: From Aflaq to Tammuz."

unit, and associated reprocessing laboratories escaped damage.<sup>44</sup> The destruction of Osirak was important as it compelled Iraq to investigate the highly enriched uranium (HEU) route and not the plutonium route. This meant the creation of a clandestine programme dedicated to the enrichment of uranium.<sup>45</sup> Later that autumn, Iraqi physicist Dr. Humam 'Abd Al-Khaliq 'Abd Al-Ghafur suggested enriching uranium using gas centrifuge technology.<sup>46</sup> Along with Electromagnetic Isotope Separation (EMIS) technology, gas centrifuges would become the regime's favoured method of uranium enrichment.

According to the ISG Report, Iraq had purchased large quantities of uranium, in various forms, including yellowcake and uranium dioxide (UO<sub>2</sub>), between 1979 and 1982.<sup>47</sup> Portugal and Niger were Iraq's two biggest suppliers of yellowcake, the others being Italy and Brazil. Portugal supplied 286.446 tons over a two-year period and Niger sent 199.9 tons between February and March 1981.<sup>48</sup> Other imports consisted of thousands of kilograms of natural, low-enriched and depleted uranium as UO<sub>2</sub> powder from both Italy and Brazil.<sup>49</sup> The production facilities designated for uranium enrichment included Tuwaitha, Al Jazira, Tarmiya, Ash Sharqat, Rashdiya and Al Athir.<sup>50</sup>

The 1980-88 Iran-Iraq War was a watershed event for the Iraqi regime. During this time Iraqi scientists were studying a number of different uranium enrichment techniques.<sup>51</sup> April 1987 saw the IAEC create a mechanism that would assign responsibility for different enrichment research methods to special groups. Group One was responsible for gaseous diffusion research, Group Two for EMIS research and support activities were designated Group Three.<sup>52</sup> Many different types of uranium enrichment were considered including, laser isotope separation (LIS), chemical enrichment and gas centrifuge technology.<sup>53</sup> In August 1987, Group One left the Tuwaitha complex with the intention of being an independent unit to be known as the

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<sup>44</sup> William E. Burrows and Robert Windrem, *Critical Mass: The Dangerous Race for Superpowers in a Fragmented World* (New York: Simon & Schuster, 1994), 275.

<sup>45</sup> Interview with Leonard Spector, 7 April 2008.

<sup>46</sup> Hamza with Stein, *Saddam's Bombmaker*, 130.

<sup>47</sup> ISG Report, II, Nuclear Programme 14, Table 1 – Declared Iraqi International Uranium Purchases.

<sup>48</sup> Ibid.

<sup>49</sup> Ibid.

<sup>50</sup> Ibid., 15.

<sup>51</sup> Ibid., 3.

<sup>52</sup> Ibid.

<sup>53</sup> Interview with Leonard Spector, 7 April 2008.

Engineering Design Directorate (EDD), located in the Al Rashdiya area of Baghdad.<sup>54</sup> This programme would fall outside the control of the IAEC and directly under Saddam Hussein's son-in-law and head of the Military Industrial Commission (MIC), Hussein Kamel. Kamel had a certain amount of autonomy with this project that he viewed as his own and because of his position within the MIC; it was funded very well and staffed with a number of well-respected scientists and technicians. The head of the programme was US-educated physicist Mahdi Obeidi.<sup>55</sup> The programme eventually evolved from one that dealt with gaseous diffusion to a gas centrifuge programme. Though the centrifuges were a modern approach to enriching uranium, they were more difficult to manufacture and the programme had not advanced to the same degree as the EMIS programme.

Iraq's preferred method of uranium enrichment pre-1991 was EMIS technology.<sup>56</sup> According to the ISG Report, EMIS was chosen because of the availability of this technology in open literature<sup>57</sup> and the overall technical competency of the Iraqi scientific community.<sup>58</sup> Another factor was that Ja'far Diya' Ja'far who had previous training/experience in EMIS technology headed this programme. As was commonplace in Iraq, it became an issue of who could promote their own agenda the best. EMIS technology utilized a machine called a calutron, which is a type of mass spectrometer. According to Frank Barnaby:

In a calutron, atoms of uranium are ionized – that is, one or more electrons in the atom are removed – and injected into a magnetic field. The particles bend as they travel in the magnetic field with the lighter particles, the uranium-235 particles, bending more than the heavier uranium-238 particles.<sup>59</sup>

EMIS technology had other appreciable benefits as well. One important factor was that no one in the West was thinking about calutrons.<sup>60</sup> This was decades old technology – first used by the USA during the Manhattan Project – and was not on anyone's radar screen as gas centrifuges had become the standard method for uranium enrichment. For Iraq it was an interim measure, *post hoc*. It was important for the Iraqis to get the NW

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<sup>54</sup> ISG Report, II, Nuclear Programme, 4.

<sup>55</sup> Interview with Jacques Baute, 25 April 2008.

<sup>56</sup> ISG Report, II, Nuclear Programme, 42.

<sup>57</sup> According to Khidhir Hamza, the United States Atomic Energy Commission had donated some Manhattan Project reports to Iraq. They were apparently given to them as part of the 1956 Atoms for Peace Program. Hamza with Stein, *Saddam's Bombmaker*, 69.

<sup>58</sup> ISG Report, II, Nuclear Programme, 42.

<sup>59</sup> Frank Barnaby, *How to Build a Nuclear Bomb and Other Weapons of Mass Destruction* (London: Granta Books, 2003), 76.

<sup>60</sup> Interview with John Walker, 24 April 2008.

programme up and running quickly and to do this they needed to use calutrons. Another factor was confidentiality. Ja'far's group working with EMIS had, as their number one priority, a need to maintain confidentiality and secrecy. No one outside of Iraq had any idea about the existence of the EMIS R&D efforts.<sup>61</sup>

The gas centrifuge programme never achieved the same levels of success that the EMIS programme had. This particular technology, though commonplace now, is technologically very difficult to perfect. Mahdi Obeidi, head of the centrifuge project states that the manufacturing of the centrifuge's component parts "requires elaborate calculations of geometry, advanced metallurgy, and knowledge of stress and tolerances beyond the capabilities of most nations."<sup>62</sup> Obeidi's team eventually produced a prototype sub-critical centrifuge, which it considered to be appropriate for large-scale exploitation.<sup>63</sup> The 1997 IAEA Report on Iraq's NW programme states that, "this achievement – greatly accelerated by foreign assistance – is considered to be consistent with the time-scale and resources invested. It is widely believed that without the interruption of the Gulf War, Iraq would have been in a position to build and commence to operate gas centrifuge pilot cascades of up to one hundred machines around the end of 1991."<sup>64</sup> Because the centrifuge programme wanted to move very fast, lots of footprints were left, so much so that by 1990 there were open source articles in the literature and the intelligence community was aware that Iraq was interested in centrifuge technology.<sup>65</sup> They had speed of development as their top priority and not confidentiality.

As previously mentioned, several different methods of uranium enrichment were investigated, there was research into uranium enrichment through solvent extraction and ion exchange processes during 1988.<sup>66</sup> There was also effort put in to developing a laser isotope separation (LIS) programme. Beginning in 1981, Iraq had committed substantial resources into exploring the possibility of LIS.<sup>67</sup> This project was under the supervision

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<sup>61</sup> Interview with Jacques Baute, 25 April 2008.

<sup>62</sup> Obeidi and Pitzer, *The Bomb in My Garden*, 6.

<sup>63</sup> "Fourth consolidated report of the Director General of the International Atomic Energy Agency under paragraph 16 of Security Council resolution 1051 (1996). United Nations Security Council Report, S/1997/779, 8 October 1997." International Atomic Energy Agency, accessed 10 March 2009, [http://www.iaea.org/OurWork/SV/Invo/reports/s\\_1997\\_779.pdf](http://www.iaea.org/OurWork/SV/Invo/reports/s_1997_779.pdf). Will be referred to as 1997 IAEA Report.

<sup>64</sup> Ibid.

<sup>65</sup> Interview with Jacques Baute, 25 April 2008.

<sup>66</sup> "Iraqi Nuclear Weapons." Federation of American Scientists, accessed 21 March 2009, <http://www.fas.org/nuke/guide/iraq/nuke/program.htm>.

<sup>67</sup> ISG Report, II, Nuclear Programme, 51.

of former Vice President of the IAEC, Dr. Humam Al-Ghafur.<sup>68</sup> While they investigated atomic vapour laser separation and molecular laser isotope separation, the programme was ultimately unsuccessful in their attempts to enrich uranium and was subsequently shut down in 1988.<sup>69</sup> Iraq also claimed to have begun exploratory work on gaseous diffusion technology that had commenced in 1982.<sup>70</sup> The intention was to develop a capability to either directly produce highly enriched uranium or to produce low enriched uranium for use as feed material for the EMIS process.<sup>71</sup> As stated earlier, the team assigned to this project was moved into the gas centrifuge area as priority was to be given to developing an indigenous centrifuge programme.

### *Persian Gulf War and Aftermath*

On 2 August 1990, Iraq invaded Kuwait. Saddam Hussein believed that Kuwait had stolen \$2.5 billion worth of oil from the Rumalia oil field that spanned the borders of the two neighbours.<sup>72</sup> He wanted reparations. Four days later, United Nations Security Council Resolution (UNSCR) 661 was passed which imposed sanctions against Iraq and occupied Kuwait.<sup>73</sup> Later that month on 25 August, UNSCR 665 was passed, authorizing maritime forces in the Persian Gulf to enforce sanctions.<sup>74</sup> On 29 November the Security Council adopted Resolution 678 which authorized the use of “all necessary means” to liberate Kuwait. The deadline for Iraq withdrawing from Kuwait was set at 15 January 1991.<sup>75</sup>

Meanwhile the Iraqi clandestine nuclear programme continued to develop. Personnel, sophisticated equipment, and testing systems pertaining to Iraq's weapons efforts were transferred from Al Tuwaitha and other sites to Al Atheer, which remained undiscovered for months after the end of the 1991 Persian Gulf War.<sup>76</sup>

On 3 April 1991 the Security Council adopted Resolution 687. This resolution created the United Nations Special Commission (UNSCOM), which was to oversee, in

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<sup>68</sup> Ibid.

<sup>69</sup> Ibid.

<sup>70</sup> 1997 IAEA Report, 36-37.

<sup>71</sup> Ibid.

<sup>72</sup> General H. Norman Schwarzkopf, *It Doesn't Take a Hero* (New York: Bantam Books, 1992), 339.

<sup>73</sup> “United Nations Security Council Resolution 661 (1990) – Adopted by the Security Council at its 2933rd meeting on 6 August 1990, Security Council Resolutions Concerning Iraq.” US Department of State, accessed 12 April 2009, <http://www.state.gov/p/nea/rls/01fs/14906.htm>.

<sup>74</sup> Ibid.

<sup>75</sup> Ibid.

<sup>76</sup> David Albright and Mark Hibbs, “Iraq's Bomb: Blueprints and Artifacts,” *Bulletin of the Atomic Scientists* (January/February 1992): 31.

conjunction with the IAEA, the destruction of Iraq's WMD programmes as well as their long-range ballistic missiles.<sup>77</sup> Eight days later the Security Council acknowledged Iraq's acceptance of Resolution 687, thereby bringing a formal ceasefire into effect.<sup>78</sup> This would mean that Iraq was to be subjected to an intrusive inspection regime and would find it difficult to deceive and mislead the international community. On 18 April, the initial disclosure of part of Iraq's weapons declaration that was required under Resolution 687 was submitted. Iraq denied having undeclared nuclear-weapons-usable material.<sup>79</sup> Nine days later, after considerable pressure from the IAEA, Iraq submitted a second declaration and admitted for the first time to having some nuclear material and facilities in addition to those previously known to the Agency.<sup>80</sup> The IAEA conducted its first on-site inspection (IAEA 1) under UNSCR 687, from 15-21 May. The team inspected the main Iraqi nuclear research facility at Al Tuwaitha and one additional site in the Baghdad area, which had been designated by UNSCOM. The principal purpose of this inspection was to verify the quantities and conditions of nuclear materials existing at the Al Tuwaitha site as declared by Iraq in its letter of 27 April.<sup>81</sup> According to the ISG Report:

As part of the denial and deception effort at the end of May 1991, (Hussein) Kamel issued orders to collect all documents and equipment indicating NPT violations. Equipment and documentation were moved to a variety of locations to hide program elements from the IAEA. Iraqi researchers were instructed by their managers to dispose of their laboratories, some of which were then set up in universities and institutes. In addition, Kamel ordered that at least one set of all nuclear-related documents and some equipment be retained by a senior scientist.<sup>82</sup>

On 7 May 1991 the head of the Ministry of Industry and Military Industrialization (MIMI), Hussein Kamel, opened the Al Atheer centre, which was

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<sup>77</sup> Section C, decides that Iraq shall unconditionally accept, under international supervision, the destruction, removal or rendering harmless of its weapons of mass destruction, ballistic missiles with a range over 150 kilometres, and related production facilities and equipment. It also provides for establishment of a system of ongoing monitoring and verification of Iraq's compliance with the ban on these weapons and missiles. Requires Iraq to make a declaration, within 15 days, of the location, amounts and types of all such items. "UNSCOM Chronology of Events." United Nations, accessed 10 March 2009, <http://www.un.org/Depts/unscom/Chronology/chronologyframe.htm>.

<sup>78</sup> Ibid.

<sup>79</sup> "Nuclear Capabilities of Iraq: A Chronology of Events." International Atomic Energy Agency, accessed 8 April 2009, <http://www.iaea.org/Publications/Booklets/Iraq/event.html>.

<sup>80</sup> Ibid.

<sup>81</sup> "Iraq Nuclear Verification Office, Chronology of Events." International Atomic Energy Agency, accessed 9 April 2009, <http://www.iaea.org/worldatom/Programmes/ActionTeam/chronology.html>.

<sup>82</sup> ISG Report, II, Nuclear Programme, 4-5.

intended to be the major nuclear weapons research and design facility as well as functioning as a materials production centre.<sup>83</sup> In August, Project 601 was established at Al Tuwaitha for the purpose of extracting highly enriched uranium from both the French and Russian research reactors.<sup>84</sup> This would have seen the Iraqis contravene IAEA safeguards by diverting the HEU from Tuwaitha to be used as the core of a nuclear device. This plan, referred to as the crash programme, was one of the most substantial pieces of information that UN inspectors received in the years following the end of the Persian Gulf War. The plant, to be used for the recovery of HEU, was built and fully commissioned and the IAEA was successful in accounting for the complete inventory of the HEU reactor fuel, throughout May and June 1991.<sup>85</sup> This suggests that the campaign for actual extraction of HEU from the reactor fuel had not been initiated and had the crash programme been carried through it could have reduced the time for Iraq to fabricate its first nuclear device by as much as two years.<sup>86</sup>

In July, the third IAEA nuclear inspection (IAEA 3) found large stockpiles of natural uranium and fifteen kilograms of HEU.<sup>87</sup> Shortly thereafter, Iraq confirmed the existence of a clandestine programme with the express purpose to manufacture several kilograms of UO<sub>2</sub>, irradiate it in the IRT-5000 reactor, and reprocess the irradiated fuel in order to chemically separate gram amounts of plutonium.<sup>88</sup> This would precipitate UNSCR 707, which demanded Iraq cease all nuclear activities of any kind and provide full, final and complete disclosure of its past weapons programmes and that it allow UNSCOM and IAEA inspection teams complete access to all UNSCOM designated sites.<sup>89</sup> By now the Iraqi deception campaign was in full-flight. Inspection teams, tasked with uncovering the clandestine nuclear weapons programme were finding it difficult to see the whole picture.

This came to a head when on 24 September, the IAEA 6 inspection team led by David Kay was detained at gunpoint in the parking lot of the Nuclear Design Centre for

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<sup>83</sup> Ibid.

<sup>84</sup> After the Persian Gulf War when it became clear that Project 601 could no longer be housed in the Active Metallurgy Testing Laboratory (LAMA) building, the uranium recovery plant was redesigned—as Project 603—so that it could be reinstalled at Al Tarmiya, which had sustained lesser bomb damage. 1997 IAEA Report, 48.

<sup>85</sup> Ibid.

<sup>86</sup> Ibid.

<sup>87</sup> Tim Trevan, *Saddam's Secrets: The Hunt for Iraq's Hidden Weapons* (London: Harper Collins, 1999), 79-83.

<sup>88</sup> 1997 IAEA Report, 15.

<sup>89</sup> “United Nations Security Council Resolution 707, 15 August 1991.” Federation of American Scientists, accessed 17 April 2009, <http://www.fas.org/news/un/iraq/sres/sres0707.htm>.

four days after discovering documentation relating to Iraq's nuclear weaponization programme.<sup>90</sup> The inspection proceeded without incident until approximately 11:00 Arabia Standard Time, when Iraqi authorities prevented the team, over strong protest of the chief inspector, from copying documents that the team was reviewing. Iraqi security surrounded the premises and the inspection was terminated. The team left the building with the copies they had been able to make, and entered the awaiting vehicles. The inspection team was then informed by Iraqi authorities that they would be detained until they were personally searched and all photographs, films, videotapes and any copies of Iraqi documents were surrendered.<sup>91</sup> This directly contravened UNSCR 707 Article 3(b) which stated that Iraq:

Allow the Special Commission, the International Atomic Energy Agency and their inspection teams immediate, unconditional and unrestricted access to any and all areas, facilities equipment, records and means of transportation which they wish to inspect.<sup>92</sup>

On 4 October, Hans Blix, Director General of the IAEA reported that IAEA 6 had obtained conclusive documentary evidence that Iraq had a programme for developing nuclear weapons.<sup>93</sup> This was determined from the information gleaned from some of the classified papers they had obtained. The key finding revealed a clandestine nuclear weapons programme supported by a wide-ranging international procurement effort.<sup>94</sup> Prior to this series of events, much was speculated and little was known. This in essence provided the IAEA with the 'smoking gun' they needed to prove Iraq's previous ambitions and its current non-compliance.<sup>95</sup> On 14 October 1991 the IAEA formally disclosed that the Al Tuwaitha facility was set up to conduct research on the weaponization of nuclear technology.<sup>96</sup>

After the tumultuous events of 1991, the period of 1992 to 1994 was relatively quiet in comparison. Inspections continued and new evidence kept on cropping up but

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<sup>90</sup> The documentation seized by inspectors and forcibly confiscated by Iraqi officials was returned to the inspectors after a period of about six hours. All documents referring to PC-3 Group Four weaponization effort were sanitized. 1997 IAEA Report, 62.

<sup>91</sup> "Nuclear capabilities of Iraq: A Chronology of Events."

<sup>92</sup> "United Nations Security Council Resolution 707, 15 August 1991." Federation of American Scientists, accessed 17 April 2009, <http://www.fas.org/news/un/iraq/sres/sres0707.htm>.

<sup>93</sup> Hans Blix, *Disarming Iraq* (New York: Pantheon Books, 2004), 25.

<sup>94</sup> "Nuclear capabilities of Iraq: A Chronology of Events."

<sup>95</sup> As a result of events such as this, the IAEA came out with the Additional Protocol, which gave the agency far greater powers and more legal authority, which was formally adopted by the Board of Governors in 1997. Interview with Jan Hillerman, 19 August 2008; Interview with Brian Jones, 4 December 2008.

<sup>96</sup> "IAEA and Iraqi Nuclear Weapons." Federation of Atomic Scientists, accessed 10 March 2009, <http://www.fas.org/nuke/guide/iraq/nuke/iaea.htm>.



IAEA inspection teams were getting a much clearer picture of the clandestine nuclear programme. According to the ISG Report, starting in 1992, Hussein Kamel dispersed some of the more valuable PC-3<sup>97</sup> and Engineering Design Center (EDC)<sup>98</sup> personnel amongst various military R&D and production facilities.<sup>99</sup> It was believed to be important for the future of the nuclear programme that they preserve “the progress and talent” that had been developed prior to 1991.<sup>100</sup> The retention of knowledge and the scientists who possessed that knowledge was of utmost importance and would provide the focus for the regime’s rationale in the upcoming years. However, ISG reports that the efforts were ultimately unsuccessful and the intellectual capital that had been built up subsequently decayed in the succeeding years.<sup>101</sup>

On 7 August 1995, Hussein Kamel, fled to Jordan. He assisted western intelligence sources in uncovering more than was previously known about Iraq's proscribed weapons programmes.<sup>102</sup> On 20 August regime officials revealed information about previously unknown aspects of the nuclear programme, among other things, during high-level technical talks with UN officials.<sup>103</sup> The official line was that Kamel had acted independently to develop a nuclear weapons programme without the consent of the Iraqi government. The regime’s attempt at proof was to make UNSCOM aware of a large cache of highly classified documents that appeared rather suddenly at Haidar House farm, which was owned by members of Kamel’s family. Iraq's failure to declare its crash programme and to give the IAEA all nuclear-related documents and materials constitute violations of Iraq's obligations under pertinent UN Security Council resolutions. The ISG Report states that:

The release of the long-concealed WMD documentation planted at Husayn Kamil’s farm in August 1995, and Iraq’s declarations in February 1996 revealing new aspects of the WMD programs were major turning points in the Regime’s denial and deception efforts following *Desert Storm*. Iraq considered the declaration to be a measure of goodwill and cooperation with the UN; however, the release of these

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<sup>97</sup> Petrochemical Project 3 was the name of Iraqi nuclear weapons project.

<sup>98</sup> When the Ministry of Industry and Military Industrialization (MIMI) was established in 1988, the Engineering Design Directorate was renamed to the EDC and had undertaken research into centrifuge enrichment technology under the direct supervision of Hussein Kamel. ISG Report, II, Nuclear Programme, 4.

<sup>99</sup> Ibid., 5.

<sup>100</sup> Ibid.

<sup>101</sup> Ibid.

<sup>102</sup> Scott Ritter, *Endgame: Solving the Iraq Crisis* (New York, Simon & Schuster, 1999), 47-48.

<sup>103</sup> Graham S. Pearson, *The UNSCOM Saga: Chemical and Biological Weapons Non-Proliferation* (Basingstoke, Macmillan, 1999), 30-31; Brian Jones, *Failing Intelligence: The True Story of How We Were Fooled into Going to War in Iraq* (London: Biteback, 2010), 31.

documents validated UNSCOM concerns about ongoing concealment and created additional questions from the international community.<sup>104</sup>

Both UNSCOM and IAEA teams conducted their inspections in a much more comprehensive and aggressive manner with the adoption of UNSCR 707. Iraq's credibility had quickly eroded and further declarations were met with suspicion. This ended up backfiring on the regime as they were keen to have some relief from UN-imposed sanctions, but what they ended up with was a much more aggressive and rigorous inspection campaign, which in turn led to a short-term political crisis between the UN and Iraq.

### THE CHEMICAL WEAPONS PROGRAMME

Iraq signed the 1925 Geneva Protocol on the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare on 17 June 1925. The protocol, which entered into force on 8 February 1928, was ratified by Iraq on 8 September 1931.<sup>105</sup> The Iraqi chemical weapons programme has its origins decades later, in the early 1960s. A select group of military officers were sent abroad for training in non-conventional weapons defence issues. Some of these individuals would soon after form the nucleus of the newly created Iraqi Chemical Corps (ICC).<sup>106</sup> Established in 1964, the ICC's was tasked with, teaching, including the "properties of chemical and biological warfare agents, their medical effects, and identification and detection methods. Usage of individual and collective protective and decontamination equipment, and appropriate prophylactic measures were also covered."<sup>107</sup> The *United Nations Monitoring, Verification and Inspection Commission Report* states that:

With minor adjustments, Iraq's Chemical Corps adopted foreign field manuals on NBC defence and acquired relevant equipment and materials, from abroad including individual protective equipment, portable field laboratories and decontamination stations. The Chemical Corps further

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<sup>104</sup> ISG Report, I, Regime Strategic Intent, 49.

<sup>105</sup> Iraq entered the following reservation, "On condition that the Iraq government shall be bound by the provisions of the Protocol only towards those States which have both signed and ratified it or have acceded thereto, and that it shall not be bound by the Protocol towards any State at enmity with Iraq whose armed forces, or the forces of whose allies, do not respect the provisions of the Protocol." "SIPRI: High Contracting Parties to the Geneva Protocol." Stockholm International Peace Research Institute, accessed 22 April 2009, [http://www.sipri.org/contents/cbwarmfare/cbw\\_research\\_doc/cbw\\_historical/cbw-hist-geneva-parties.html#I](http://www.sipri.org/contents/cbwarmfare/cbw_research_doc/cbw_historical/cbw-hist-geneva-parties.html#I).

<sup>106</sup> ISG Report, III, Chemical Programme, 5.

<sup>107</sup> United Nations Monitoring, Verification and Inspection Commission (UNMOVIC) Compendium of Iraq's Proscribed Weapons Programmes in the Chemical, Biological and Missile areas, June 2007, Chapter 3, 49. Will be referred to as UNMOVIC Compendium.

introduced NBC training procedures for all other units within Iraq's Armed Forces. Such military training involved the use of CW agent simulants in field exercises.<sup>108</sup>

By the end of the decade, the ICC had obtained some general knowledge in the fields of chemical defence. This knowledge would provide a solid foundation in moving towards an offensive CW capability.<sup>109</sup>

In 1971 a group of ICC officers sought authorization to synthesize small quantities of CW agents, mustard, tabun, and CS gas (orthochlorobenzalmalononitrile), for "familiarization and the experience."<sup>110</sup> The Iraqi General Staff ultimately approved the request and the construction of the Al Rashad facility was commissioned.<sup>111</sup> Three years later the programme was retooled and the Al Hasan Ibn al-Haytham Institute was created under the auspices of the Ministry of Higher Education and Scientific Research.<sup>112</sup> The Institute took its name from a famous Iraqi mathematician, born in Basra (965-1040 CE) named Abu Ali al-Hasan ibn al-Haytham and would be the predecessor of Iraq's proscribed offensive CBW programmes of the 1980s<sup>113</sup>

The Al Hasan Institute was organized into three separate centres as well as an administrative headquarters. The UNMOVIC Compendium states that, "The Institute's First Centre was responsible for CW-related activities. In 1974, it took over the site at Al Rashad village, which was previously operated by the Chemical Corps."<sup>114</sup> According to the ISG Report, the Al Hasan Institute was tasked with the research and synthesis and production of mustard, tabun, CS and some organophosphate pesticides, with the end result being large-scale production.<sup>115</sup> Progress was achieved in the laboratory production of mustard, tabun, and, to some degree, sarin.<sup>116</sup> The Al Hasan project met the same fate as Al Rashad. A presidential decree dissolved the project as it was found to have made "insufficient progress" towards the production of chemical weapons.<sup>117</sup> Some work in CW ultimately continued in 1978 when the former head of the Chemical Corps, Bizar al-Attar submitted a five-year plan that included the production of

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<sup>108</sup> Ibid.

<sup>109</sup> Ibid.

<sup>110</sup> ISG Report, III, Chemical Programme, 5.

<sup>111</sup> Ibid., 5-6.

<sup>112</sup> Ibid.

<sup>113</sup> Ritter, *Endgame*, 83.

<sup>114</sup> UNMOVIC Compendium, Chapter 3, 51.

<sup>115</sup> ISG Report, III, Chemical Programme, 56

<sup>116</sup> UNMOVIC Compendium, Chapter 3, 52.

<sup>117</sup> ISG Report, III, Chemical Programme, 6.

chemical weapons.<sup>118</sup> The ISG reports that, “By the end of 1979, a reorganized Chemical Corps started using the expanded Al Rashad site to produce CW agents, ostensibly for the testing of CW defensive gear and detection equipment.”<sup>119</sup>

The Iraq CW programme did not fully find its feet until the end of the decade. Prior to then it was more a case of small-scale experimentation and becoming familiar with select agents. By 1979, Iraq had obtained the ability to commence large-scale CW development. The scientists and technicians that would form the nucleus of the chemical programme had acquired valuable experience and knowledge in, laboratory synthesis of CW agents, scaling-up production, building CW research capabilities, training personnel, forming a procurement network, founding several production plants and obtaining a number of key pieces of pilot and industrial size equipment.<sup>120</sup> The efforts of the 1970s eventually culminated in the formation of Iraq’s large-scale military chemical weapons programme. The CW programme would become a focal point of the ensuing 1980-88 Iran-Iraq War.

### *The Iran-Iraq War*

The beginning of the new decade saw an escalation of tensions in the Persian Gulf. This was precipitated by the expulsion of Shia cleric Ayatollah Ruhollah Khomeini from the Iraqi Shia holy city of Najaf in October 1978.<sup>121</sup> Khomeini left Iraq for Iran and was instrumental in engineering the overthrow of Shah Mohammad Reza Pahlavi and establishing a new government in February 1979. The Islamic Revolution eventually resulted in a Shia controlled, fundamentalist Iran, which had significant implications for Iraq's national security environment as Shi'ite demonstrations spilled over the border into southern Iraq.<sup>122</sup> Further to this, on 17 September President Saddam Hussein symbolically tore up the 1975 Algiers Agreement in an act of defiance. This agreement was meant to end the long-standing dispute over control of the Shatt al-Arab waterways that had existed for centuries.<sup>123</sup> The situation continued to deteriorate and

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<sup>118</sup> Ibid.

<sup>119</sup> Ibid.

<sup>120</sup> UNMOVIC Compendium, Chapter 3, 55.

<sup>121</sup> Tripp, *A History of Iraq*, 212.

<sup>122</sup> “Country Profile: Iran.” US Department of State, accessed 11 March 2009, <http://www.state.gov/r/pa/ei/bgn/5314.htm>.

<sup>123</sup> Efraim Karsh, “Military Power and Foreign Policy Goals: The Iran-Iraq War Revisited,” *International Affairs*, Volume 64, Number 1 (Winter 1987-88): 83-95.

then on 22 September Iraqi units crossed the border into Iran eventually capturing and occupying Iranian territory.

On 16 November 1980, Teheran Radio claimed that Iraq had used chemical bombs in the fighting around the southern Iranian town of Susangerd.<sup>124</sup> The Iranian allegations were not specific regarding the agents used, only saying that the weapons used “spread germs and caused blisters.”<sup>125</sup> This would appear to be the first allegation of Iraqi use of chemical weapons against Iran. However, this incident was not included in Iran’s letter of 21 April 1988 that was addressed to the Secretary General.<sup>126</sup> The first officially recorded complaint regarding Iraq’s use of chemical weapons occurred on 13 January 1981. According to Iranian allegations, Iraq had used chemical weapons against Iranian troops at Halaleh and Neykhzar, causing ten casualties.<sup>127</sup> No reference was made as to what chemical agent was used. Four more alleged Iraqi attacks using chemical weapons were made by Iran in 1981. Of these four, only the alleged incident on 21 March at Howeyzeh would result in casualties.<sup>128</sup> The failure of Iraqi forces to achieve victory in the early days of the war helped provide the impetus for the creation of its large-scale, strategic chemical warfare programme called Research Centre 922 or Project 922.<sup>129</sup> This project was launched on 8 June 1981 and was to develop mustard, tabun, sarin, VX and white phosphorus.<sup>130</sup>

The Iraqi CW campaign continued. According to Iranian allegations there were six CW attacks against Iran, totalling twenty-nine casualties.<sup>131</sup> In July 1982 Iran launched Operation *Ramadan*. This was an Iranian offensive intended to break the Iraqi lines and capture Iraqi territory near Basra. What is important about this operation was that Iran had utilized “human-wave” attacks conducted primarily by Pasdaran and Basij volunteer forces.<sup>132</sup> These largely untrained and ill-equipped troops were used to clear minefields and prepare the area for the arrival of Iranian armour. The Iranians sustained

<sup>124</sup> Tony Allen-Mills, “500 Die in Iraqi response –Attempt to Break Iranian Morale,” *Daily Telegraph*, 17 November 1980, 1 & 30.

<sup>125</sup> Farouk Nassar, “Iranian Warplanes Hit Kuwaiti Outpost,” *Associated Press*, 16 November 1980.

<sup>126</sup> “Letter Dated 20 April 1988 from the Acting Permanent Representative of the Islamic Republic of Iran to the United Nations Addressed to the Secretary-General, S/19816.” United Nations, accessed 12 March 2009, <http://documents.un.org/mother.asp>.

<sup>127</sup> Ibid.

<sup>128</sup> Ibid.

<sup>129</sup> ISG Report, III, Chemical Programme, 6.

<sup>130</sup> Ibid.

<sup>131</sup> “Letter Dated 20 April 1988 from the Acting Permanent Representative of the Islamic Republic of Iran to the United Nations Addressed to the Secretary-General, S/19816.”

<sup>132</sup> The official Persian name is Sepāh-e Pāsdārān-e Enqelāb-e Eslāmi, which translates as Army of the Guardians of the Islamic Revolution; Nirou-ye Moqavemat-e Basij or Mobilization Resistance Force is the official term for Basij volunteer troops.

an immense number of casualties, but they enabled Iran to recover some territory before the Iraqis could repel the bulk of the invading forces. That October, the Iraqi Permanent Representative to the UN denied that Iraq had ever used chemical weapons against Iran.<sup>133</sup>

The year 1983 was an important one as it marked the first formal allegations, to the UN, that Iraq was using chemical weapons against Iranian targets. According to Iranian sources, there were thirty-three attacks with chemical weapons against Iranian targets, the majority of which were described as either mustard gas or blister gas.<sup>134</sup> This would be consistent with Iraqi production capabilities at the time. After Project 922 came online, both the Al Rashad and Al Muthanna sites had produced roughly 150 tons of mustard during the course of 1983, along with 85 tons produced the previous year.<sup>135</sup> Also in 1983, Iran launched three major, though largely unsuccessful, human wave offensives. These attacks were characterized with enormous losses of troops and minimal gains in terms of territory.<sup>136</sup> What was emerging was a heightened Iranian commitment to wage a war of attrition against Iraq. The Iranian military was not as well equipped as its Iraqi counterpart, but where it was lacking in material it more than made up for in the number of troops it could deploy at any given time. These tactics would eventually force the Iraqi regime to reevaluate how it was conducting the war up to that point.

Beginning in 1984, there was a shift in Baghdad's overall strategic goals. Instead of attempting to capture targets and territory within Iran, Baghdad was more concerned with preventing Iranian incursions and loss of territory within its own borders. Iraq's use of chemical weapons became more pronounced as well between 1984-86. Iraq had become the first nation to use a nerve agent in combat when it employed tabun-filled munitions against Iranian troops.<sup>137</sup> The reliance on chemical weapons signalled the intent to defend Iraqi territory at all costs. Some intelligence reports at the time made mention of the serious deficiencies in Iraq's defensive posture. For example:

CW, ineptly employed, has not proved to be a panacea to make up for other weaknesses. Non-chemical tactical weaknesses such as failure to

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<sup>133</sup> *Iraq News Agency*, as reported in 'Iran-Iraq War,' BBC-SWB, 1 November 1982, ME/7171/i.

<sup>134</sup> "Letter Dated 20 April 1988."

<sup>135</sup> ISG Report, III, Chemical Programme, 8.

<sup>136</sup> "Iran-Iraq War (1980-1988)" Global Security.org, accessed 1 August 2010, <http://www.globalsecurity.org/military/world/war/iran-iraq.htm>.

<sup>137</sup> ISG Report, III, Chemical Programme, 5; "CW Agent Factsheet – Tabun." Stockholm International Peace Research Institute, accessed 10 November 2010, <http://archives.sipri.org/contents/expcon/tabun.html>.

maximize advantages and ineffective employment of tactical airpower carry over into the employment of CW. CW employment shortcomings have included use of inadequate concentrations in relation to required area coverage, enemy troops numbers, weather and terrain, ineffective delivery, and failure to integrate CW properly with the scheme of manoeuvre.<sup>138</sup>

Iraq's use of CW would become more of an issue for the international community during this time. UN Security Council Resolution 582 would take a different approach to the situation in the Gulf. Unlike previous Security Council Resolutions, 582 addressed the issue of Iraqi CW use against Iranian targets.<sup>139</sup> This read:

Profoundly concerned by the unanimous conclusion of the specialists that chemical weapons on many occasions have been used by Iraqi forces against Iranian forces, most recently in the course of the present Iranian offensive into Iraqi territory, the members of the Council strongly condemn this continued use of chemical weapons in clear violation of the Geneva Protocol of 1925 which prohibits the use in war of chemical weapons.<sup>140</sup>

Not that this would change anything, but it showed that the international community, while still somewhat indifferent to the situation in the Persian Gulf, was slowly becoming more aware of Iranian CW allegations.

The period from 1984 to 1986 was marked by Iraq's gradual escalation of CW attacks, whereas the period of 1987 to 1988 was highlighted by an intensified approach to CW attacks.<sup>141</sup> Not only were the Iraqis using chemicals in defensive or counter-offensive operations, they were also employing them in order to try and recover lost territory. Another tactic was to saturate an area with large amounts of chemical agent and then send in offensive troops to take the area. Depending on the type of chemical weapon used, Iraqi forces would wait between thirty and sixty minutes before moving in on an area that had been saturated. While their troops were better equipped than the Iranians, they were still suffering a high number of CW-related casualties, though not

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<sup>138</sup> "Impact and Implications of Chemical Weapons Use in the Iran-Iraq War." Central Intelligence Agency, GulfLINK Collection, accessed 18 May 2009, [http://www.fas.org/irp/gulf/cia/960702/72566\\_01.htm](http://www.fas.org/irp/gulf/cia/960702/72566_01.htm).

<sup>139</sup> "United Nations Security Council Resolution 582 of 24 February 1986." United Nations, accessed 22 April 2009, <http://www.un.org/Docs/scres/1986/scres86.htm>.

<sup>140</sup> Ibid.

<sup>141</sup> "Iraqi Chemical Warfare Data." Federation of American Scientists, accessed 22 April 2009, [http://www.fas.org/irp/gulf/cia/970129/970110\\_092596\\_UI\\_0001.html](http://www.fas.org/irp/gulf/cia/970129/970110_092596_UI_0001.html).

nearly as high as the Iranian troops they were targeting.<sup>142</sup> In April 1988, Iran had published an account detailing the number of Iraqi CW attacks during the period of January 1981 to March 1988. According to a UN Conference on Disarmament document, 242 attacks were carried out affecting 44 000 individuals.<sup>143</sup>

During the phase of the war commonly referred to as “the war of the cities,” Iraq had begun to target Iranian civilian populations with chemical weapons.<sup>144</sup> The first known incident of Iraqi targeting of Iranian civilians occurred on 28 June 1987 in the Kurdish town of Sardasht, near the northwest border with Iraq.<sup>145</sup> On 16 March 1988 the northern Kurdish city of Halabja was the scene of an Iraqi chemical weapons attack that resulted in thousands of casualties. Iranian forces had overrun Halabja in the days leading up to the 16 March attack. The Iraqi counterattack began mid-morning with conventional airstrikes and artillery shelling from the town of Sayed Sadeq to the north.<sup>146</sup> This was followed by wave after wave of low-flying Iraqi Air Force jets. According to eyewitness accounts, the first wave of air strikes appeared to have included the use of napalm or phosphorus – something flammable. Later that afternoon, at approximately 15:00 local time, residents noticed an acrid smell permeating the air. One resident noted that it smelled “very bad, like snake poison.”<sup>147</sup> The exact number of casualties resulting from the attack on Halabja is unknown.<sup>148</sup> However, it has been widely speculated that casualties may have been in excess of 5000.<sup>149</sup> The attack on Halabja was one incident among many in what was known as the Al Anfal Campaign.

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<sup>142</sup> “Iraqi CW Use in Iran-Iraq War.” Federation of American Scientists, accessed 22 April 2009, [http://www.fas.org/irp/gulf/cia/960626/63704\\_01.htm](http://www.fas.org/irp/gulf/cia/960626/63704_01.htm).

<sup>143</sup> Letter Dated 11 April 1988 from the Permanent Representative of the Islamic Republic of Iran Addressed to the President of the Conference on Disarmament, Conference on Disarmament Document CD/827, 12 April 1988.

<sup>144</sup> The war of the cities was a phase of the conflict where both Iran and Iraq engaged in firing ballistic missiles at non-military, urban areas within each other’s borders. See Anthony H. Cordesman and Abraham R. Wagner, *The Lessons of Modern War: Volume II – The Iran-Iraq War* (Boulder: Westview Press, 1990),

<sup>145</sup> *IRNA* (in English), 16:04 GMT, 28 June 1987, as reported in ‘Iranian Military Communiques and Reports,’ BBC-SWB, 2 July 1987, ME/8609/A/1; Letter dated 29 June 1987 from the Charge d’affaires a.i. of the Permanent Mission of the Islamic Republic of Iran to the United Nations - Addressed to the Secretary-General, UN document S/18953-A/42/371, 29 June 1987; “Iran Claims 10 Civilians Killed, 650 Injured in Gas Attacks,” *Associated Press*, 28 June 1987.

<sup>146</sup> “Genocide in Iraq: The Anfal Campaign Against the Kurds.” Human Rights Watch, accessed 22 April 2009, <http://www.hrw.org/legacy/reports/1993/iraqanfal/ANFAL3.htm>.

<sup>147</sup> *Ibid.*

<sup>148</sup> For a detailed examination of the incident at Halabja see Joost R. Hiltermann, *A Poisonous Affair: America, Iraq, and the Gassing of Halabja* (Cambridge: Cambridge University Press, 2007).

<sup>149</sup> Javed Ali puts the number of CW casualties between 5000 and 8000. Javed Ali, “Chemical Weapons and the Iran-Iraq War: A Case Study in Noncompliance,” *The Nonproliferation Review* (Spring 2001): 52.



The mastermind of the Anfal Campaign, was Ali-Hasan al-Majid, first cousin to President Saddam Hussein. In a speech made to Ba'th Party members in 1987, al-Majid laid out his thoughts on dealing with the Kurdish situation in northern Iraq. He said:

This is my intention, and I want you to take serious note of it. As soon as we complete the deportations, we will start attacking them everywhere according to a systematic military plan. Even their strongholds. In our attacks we will take back one third or one half of what is under their control. If we can try to take two-thirds, then we will surround them in a small pocket and attack them with chemical weapons. I will not attack them with chemicals just one day, but I will continue to attack them with chemicals for fifteen days. Then I will announce that anyone who wishes to surrender with his gun will be allowed to do so. I will publish one million copies of this leaflet and distribute it in the North, in Kurdish, Sorani, Badinani and Arabic. I will not say it is from the Iraqi government. I will not let the government get involved. I will say it is from here [the Northern Bureau]. Anyone willing to come back is welcome, and those who do not return will be attacked again with new, destructive chemicals. I will not mention the name of the chemical because that is classified information. But I will say with new destructive weapons that will destroy you. So I will threaten them and motivate them to surrender. Then you will see that all the vehicles of God Himself will not be enough to carry them all. I think and expect that they will be defeated. I swear that I am sure we will defeat them.<sup>150</sup>

The Anfal Campaign lasted from approximately 23 February to 6 September. Like the Halabja massacre, the precise number of casualties is not known. Estimates put the number between 50 000 and 100 000.<sup>151</sup> In response to the Patriotic Union of Kurdistan's (PUK) claims that Anfal took the lives of 182 000 Kurds, al-Majid apparently exclaimed that it could not have been more than 100 000.<sup>152</sup> Regardless of the final number, the Anfal Campaign showed that Iraq was prepared to defend its interests no matter what the cost.

Hostilities between Iran and Iraq ended on 20 August 1988, one full month after the formal adoption of UNSCR 598. The casualty figures resulting from the eight-year war are uncertain, though estimates suggest more than one and a half million war and war-related casualties. Iran acknowledged that nearly 300 000 people died in the war and estimates of the Iraqi dead range from 160 000 to 240 000 maimed. Anthony Cordesman and Abraham Wagner calculate that there were between 1 050 000 and 1

<sup>150</sup> "Genocide in Iraq," Appendix A: The Ali Hassan Al-Majid Tapes.

<sup>151</sup> See Hiltermann, *A Poisonous Affair*, 132-135.

<sup>152</sup> "Genocide in Iraq," Appendix A: The Ali Hassan Al-Majid Tapes.

930 000 Iranian casualties and 555 000 to 1 040 000 Iraqi casualties<sup>153</sup> They also estimate that the total cost of the war for each side in monetary terms was \$69 billion for Iran and \$159 billion for Iraq.

### *Desert Storm and UNSCOM*

After the end of the Iran-Iraq War there was no immediate demand for chemical weapons, yet developmental efforts in improving production methods, binary chemical weapons, new delivery methods and precursor production, continued throughout 1989 and 1990.<sup>154</sup> The newly renamed Muthanna State Establishment (MSE) had become the locus for Iraq's large-scale chemical programme. According to the ISG Report, the Research and Development Directorate at MSE was experimenting with multiple chemical agents.<sup>155</sup> This Directorate also had individual departments dedicated to the development of mustard agents, nerve agents and others.<sup>156</sup> The experiences of the war with Iran had shown Baghdad that there was an intrinsic value in possessing chemical weapons. R&D into other types of chemical munitions was also being looked at, some of which would prove to be a major point of interest for western governments and enemies of Iraq.

On 1 April 1990, Saddam Hussein in a speech broadcast on Baghdad Radio made a startling declaration, one that caught many in western intelligence agencies off guard. Hussein claimed that:

We do not need an atomic bomb. We have the binary chemical. Let them take note of this. We have the binary chemical. According to our information only the United States and the Soviet Union have it. They still have not reached an agreement with respect to its disarmament. It exists in Iraq. So that the Iraqis may know, it existed during the last period of the war – I believe during the last year of the war. It was there. In spite of this, we did not use it against the Iranians. We did not use it against the Iranians. We said that the weapons we had were more than enough, and hoped that God would enable us to liberate our land without it. Why, then, do we need the atomic bomb?<sup>157</sup>

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<sup>153</sup> They also estimate that between 450 000 and 730 000 Iranian deaths and 150 000 to 340 000 Iraqi deaths. These figures are based on unclassified CIA estimates. Cordesman and Wagner, *The Lessons of Modern War*, Table 1.1 Estimates of the Cost of the Iran-Iraq War: 1980-1988, 3; Letter Dated 11 April 1988 from the Permanent Representative of the Islamic Republic of Iran Addressed to the President of the Conference on Disarmament, Conference on Disarmament Document CD/827, 12 April 1988.

<sup>154</sup> UNMOVIC Compendium, Chapter 3, 87-88.

<sup>155</sup> This was taken to be around 40 chemical compounds. ISG Report, III, Chemical Programme, 9.

<sup>156</sup> Ibid.

<sup>157</sup> Speech by President Saddam Hussein at a ceremony honoring the Iraqi Minister of Defence, the Minister of Industry and Military Industrialization and members of the Armed Forces General Command,

What exactly did Saddam mean when he said binary chemical? Avigdor Haselkorn states that, “Saddam’s concept of a binary chemical weapon covered a number of approaches that the Iraqis had adopted to increase the effectiveness of their CW.”<sup>158</sup> Iraqi binary weapons were along the lines of putting two toxic chemicals together in one compartment immediately prior to use as, opposed to the idea of having two inert chemicals in separate compartments in the munition and enabling them to mix shortly before impact. This mix-before-flight binary system ended up being used to fill 1000 binary bombs as well as 50 al-Hussein warheads by August 1990.<sup>159</sup> This speech not only caught western intelligence off guard, and according to the ISG Report, his own chemical weapons scientists as well.<sup>160</sup>

Throughout 1990 Saddam was defiant. His threats grew in scope and in frequency. On 12 April he reiterated his threats to drench Israel with chemical weapons if Iraq were attacked with nuclear weapons.<sup>161</sup> Five days later, speaking at another ceremony he made a thinly veiled reference to use whatever means necessary to defend any Arab state that is attacked by another country.<sup>162</sup> Later that summer Saddam again stated that he had binary CW and believed it enough to deter Israel from attacking.<sup>163</sup> With Saddam’s increasing rhetoric and threats to use CW, intensive production of chemical munitions had restarted. That April, VX was produced at the Dhia plant although according to Iraqi officials, without any specific orders from the Ministry of Defence.<sup>164</sup> According to the UNMOVIC Compendium:

In addition to chemical munitions produced by the MSE during the Iran-Iraq war, two new types of munitions that were under the development and testing by that time were included into the production schedule for 1990. These included types of weapons considered as strategic by their nature, capable to deter potential foes from taking any steps against Iraq for fear of consequences. The perceived deterrent role of CW in 1990

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1 April 1990. The full recording was broadcast on Baghdad domestic radio at 1030 GMT, 2 April 1990, as reported in FBIS-NES-90-064, 3 April 1990, 32-36.

<sup>158</sup> Avigdor Haselkorn, *The Continuing Storm: Iraq, Poisonous Weapons, and Deterrence* (New Haven: Yale University Press, 1999), 23.

<sup>159</sup> By 1998 UNSCOM had discovered remnants of 45 “special warheads” that the regime had dismantled. ISG Report, III, Chemical Programme, 9-32.

<sup>160</sup> Ibid.

<sup>161</sup> Full text of remarks made during a meeting in Mosul on 12 April 1990 between, Saddam Hussein, Foreign Minister Tariq Aziz, the US ambassador to Iraq, Senators Robert Dole, Howard Metzenbaum, Frank Murkowski, James McClure and Alan Simpson. Broadcast was read by an announcer on Baghdad domestic radio at 1400 GMT, 16 April 1990, translated from Arabic in FBIS-NES-90-074, 17 April 1990, 5-13.

<sup>162</sup> INA from Baghdad, 2150 GMT, 17 April 1990, as reported in FBIS-NES-90-075, 18 April 1990.

<sup>163</sup> Jackson Diehl and Caryle Murphy, “New Middle East War Seen Unlikely,” *Washington Post*, 2 July 1990, A1 & A15.

<sup>164</sup> UNMOVIC Compendium, Chapter 3, 146.

concentrated more on new delivery means (the Al Hussein warhead and R-400 bomb) but not on new CW agents, except for the concept of 'Iraqi binary' for sarin.<sup>165</sup>

With the 15 January UN imposed deadline for Iraq's withdrawal from Kuwait approaching, Iraq was putting significant effort into agent weaponization and means of delivery. Iraq had shown that it had the technical skill to be able to produce lethal chemical agents. Now they had to make sure they had the delivery systems to back up their threats.

Prior to the deadline for Iraq to withdraw from Kuwait, US Secretary of State James Baker met with Iraqi Foreign Minister Tariq Aziz in Geneva. Baker handed Aziz a letter from President George Bush describing probable US reprisals to an Iraqi non-conventional weapons attack to be "the most terrible response."<sup>166</sup> Though there was no direct reference to the US using nuclear weapons in retaliation, which was consistent with the American policy of calculated ambiguity, it was widely taken as such. After Coalition forces liberated Kuwait and scattered the remnants of Iraq's army, the atmosphere in Baghdad was one of triumph and victory. In Saddam's eyes, he viewed the war as one where he stood up to the US and came out relatively unscathed. Baghdad was still standing, Iraq was not occupied and most importantly from his point of view, he was still in power.

According to the ISG Report, Saddam believed that the "deployment of CW and the delegated authority to use them, contributed to the US not driving on to Baghdad."<sup>167</sup> This was yet another example of Saddam believing that chemical weapons saved Iraq and saved himself. Much the same as during the war with Iran, the regime believed that chemical weapons prevented Coalition forces from entering and occupying Baghdad. This is specious reasoning, as the Coalition simply did not have the mandate to enter and/or occupy Iraq. The mission as per UNSCR 660 demanded that Iraq withdraw immediately and unconditionally all its forces to the positions in which they were located on 1 August 1990.<sup>168</sup> The use of force was authorized under UNSCR 678 if Iraq was found to be in non-compliance with the earlier Resolution, which ended up being the case.

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<sup>165</sup> Ibid.

<sup>166</sup> Richard Butler, *The Greatest Threat: Iraq, Weapons of Mass Destruction, and the Growing Crisis of Global Security* (New York: Public Affairs, 2000), 37.

<sup>167</sup> ISG Report, III, Chemical Programme, 9.

<sup>168</sup> "United Nations Security Council Resolution 660 of 2 August 1990." United Nations, accessed 22 April 2008, <http://www.un.org/Docs/scres/1990/scres90.htm>.

On 3 April 1991 the UN Security Council adopted Resolution 687, as already noted. Article 9b(i) states:

The forming of a special commission which shall carry out immediate on-site inspection of Iraq's biological, chemical and missile capabilities, based on Iraq's declarations and the designation of any additional locations by the special commission itself.<sup>169</sup>

It would not be until 9 June when UNSCOM's first inspection of Iraqi chemical weapons facilities could take place. The first site inspected was the Muthanna State Establishment, which was declared as the primary chemical weapons R&D and munition-filling site.<sup>170</sup> Over the next four years UNSCOM uncovered an increasingly tangled web of lies vis-à-vis the chemical programme. One of UNSCOM's key findings was the discovery of the VX nerve agent production programme.<sup>171</sup> While there are doubts as to the quality and quantity of agent, Iraq still attempted VX production, which, according to chemical weapons experts, is no small feat.<sup>172</sup> Outside of Iraq, quite a bit was known of their chemical programme mostly due to the frequency of use during the war with Iran. One of the big surprises was not the size of the programme but the size of the stockpiles of weapons.<sup>173</sup> Iraq had amassed a significant amount of chemical precursors, bulk agent and filled munitions prior to the end of *Desert Storm*. After inspectors went in and got a clear picture of what they were dealing with, material balances needed to be made and all of the precursors, equipment and munitions had to be accounted for. Following that, all of the remaining chemical weapons and associated materials were destroyed.

That October, UNSCOM had developed a general policy for dealing with Iraq's remaining chemical weapons. They were tasked with the following:

1. All weapons and weapons systems (whether fully functional or not) including all their related subsystems and components were to be destroyed.
2. Equipment and materials:
  - a. Equipment or material specially designed or used for prohibited under SCR 687 activities were to be destroyed (or removed from Iraq if destruction would not be practically possible);
  - b. Dual purpose, multi-purpose or general purpose equipment or materials,

<sup>169</sup> "United Nations Security Council Resolution 687 of 8 April 1991." Federation of American Scientists, accessed 22 April 2008, <http://www.fas.org/news/un/iraq/sres/sres0687.htm>.

<sup>170</sup> Pearson, *The UNSCOM Saga*, 85.

<sup>171</sup> "UNSCOM Main Achievements." United Nations, accessed 25 April 2009, <http://www.un.org/Depts/unscom/Achievements/achievements.html>.

<sup>172</sup> Interview with Ron Manley 28 April 2008.

<sup>173</sup> Ibid.

- i. that were exclusively or primarily used (or intended to be used) in prohibited activities or activities related to prohibited items shall be destroyed (or removed from Iraq if destruction is not practically possible);
- ii. that were only in part used (or intended to be used) in prohibited activities related to prohibited items shall be destroyed unless the Special Commission upon specific written request from Iraq authorizes their use as an exception in activities not prohibited by Resolution 687 (1991).

### 3. Buildings

- a. Buildings that have distinctive features making them specifically suitable for prohibited activities related to prohibited items shall be destroyed (if it is not practically possible to destroy the building, its distinctive features shall be destroyed);
- b. Standard buildings shall be destroyed unless the Special Commission upon specific written request from Iraq authorizes their use as an exception in activities not prohibited by Resolution 687 (1991).<sup>174</sup>

According to UNSCOM documents, by the end of 1998, UNSCOM had supervised the destruction of the following proscribed items:

- 38 537 filled and empty chemical munitions
- 690 tons of bulk chemical agent
- More than 3000 tons of chemical precursors
- 426 pieces of chemical weapons production equipment
- 91 pieces of related analytical instruments<sup>175</sup>

This does not include the chemical weapons that Iraq allegedly destroyed after inspections began. It was in June 1991 when Saddam Hussein ordered the former deputy of the chemical programme, Dr. Mahmud Faraj Bilal to destroy all of their hidden CW (and BW) materials.<sup>176</sup> This act would be the cause for concern with UNSCOM as they were interested in cataloguing and accounting for all aspects of the chemical programme. ISG reports that available evidence points to Iraq getting rid of its hidden chemical weapons and precursors, but retaining key documents and some dual-use equipment.<sup>177</sup> It is thought that Iraq did this in order to be able to restart its chemical programme after inspections and once sanctions were lifted. Unfortunately for them, by getting rid of the evidence and retaining the documentation, it gave UNSOCM inspectors a level of uncertainty regarding their disclosures. It would end up being a big

<sup>174</sup> UNMOVIC Compendium, Chapter 3, 254.

<sup>175</sup> "UNSCOM: Main Achievements." A detailed account of UNSCOM's chemical destruction efforts can be found in UN Security Council Report S/1999/94 of 29 January 1999, otherwise known as The Butler Report.

<sup>176</sup> ISG Report, III, Chemical Programme, 11.

<sup>177</sup> Ibid.

mistake for them and meant that the intrusive inspection regime they were faced with would continue.

Over the next few years UNSCOM continued its inspection regime as outlined by UNSCR 687. By mid-1995 there had been approximately twenty-five chemical inspections conducted at multiple sites within Iraq. Throughout the inspections Iraq had, according to Graham Pearson, “shown a marked lack of transparency, disclosing information only when confronted with evidence by UNSCOM.”<sup>178</sup> Iraqis were meticulous record keepers and it was not believed that they had destroyed all of their documentation relating to the chemical programme. This forced the inspectors down a different path. UNSCOM had begun to pursue this issue with the suppliers and their governments. If they could get a detailed and accurate list of inventory from the suppliers, they would be closer to the bottom of the proscribed chemical weapons programme. The big breakthrough occurred in August 1995 with the defection of Hussein Kamel. On 8 August Kamel left Iraq for Jordan. This was a major blow to the Iraqi regime as Kamel was not only the head of MIC, an organization responsible for the development and manufacture of proscribed weapons, he was also married to one of Saddam’s daughters. His defection set in motion a chain of events that would culminate in the “discovery” of a large cache of new and previously unseen documents.<sup>179</sup>

Twelve days after Kamel’s defection, UNSCOM Executive Chairman Rolf Ekéus was asked to accompany the head of the National Monitoring Directorate, Brigadier General Hussam Amin, to a location some forty kilometres southwest of Baghdad. This location was the Haidar House farm – one of Hussein Kamel’s properties. The chairman was taken to a building on the property and was shown dozens of metal boxes, all of which were filled with documents relating to Iraq’s proscribed weapons programmes.<sup>180</sup> By all accounts, the boxes were placed there shortly after Kamel’s departure to make it look like he was the one responsible for Iraq’s proscribed weapons programmes. None of the boxes had any dust covering them and the lock on the building door was new. Though it seemed highly unlikely that Kamel had hidden these documents on this farm for the past four years, it proved to be a significant event. All told, there were roughly 1.5 million pages of documents.<sup>181</sup>

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<sup>178</sup> Pearson, *The UNSCOM Saga*, 101.

<sup>179</sup> “Military Industrialization Corporation (MIC).” Federation of American Scientists, accessed 25 April 2009, <http://www.fas.org/nuke/guide/iraq/agency/mic.htm>.

<sup>180</sup> Charles Duelfer, *Hide and Seek: The Search for Truth in Iraq* (New York: Public Affairs, 2009), 110.

<sup>181</sup> Ibid.

It was now clear that Iraq was interested in cooperating with UNSCOM at previously unseen levels. What they were attempting to do with this new discovery was to place 100% of the blame on the “traitor and criminal” Hussein Kamel. In the aftermath of that event, the Commission was able to bring under its control a massive amount of documentation and material directly linked to its proscribed programmes. While there were many gaps that still needed to be filled in, the discovery at the Haidar House farm proved to be a significant event in the unravelling of Iraq’s chemical weapons programme.

### **THE BIOLOGICAL WEAPONS PROGRAMME**

Of Iraq’s three proscribed weapons programmes, the biological programme was the smallest in size and scale.<sup>182</sup> It also had the most recent beginning. On 11 May 1972 Iraq signed the Biological and Toxin Weapons Convention, years before there was any real interest in acquiring biological weapons.<sup>183</sup> According to Iraqi declarations, interest in acquiring a biological warfare capability first occurred in 1974, when the Al Hasan Ibn al-Haytham Institute was created to conduct scientific, academic and applied research in the fields of chemistry, physics and microorganisms.<sup>184</sup> Though the institute was under the direction and control of the Ministry of Higher Education and Scientific Research it was little more than a front for Iraq’s clandestine BW and CW programmes.<sup>185</sup> In fact, since the early BW and CW programmes were both situated at the Al Hasan Institute, they would suffer the same early growing pains and ultimately the same fate when it was shut down in 1979, six months before Saddam Hussein ascended to the Presidency. Later that year, the Scientific and Technical Research Directorate (STRD) was created to replace Al Hasan as the front for the clandestine BW programme.<sup>186</sup> Small-scale activities relating to BW took place at STRD, which eventually became known as the Technical Research Centre (TRC). It was not until 1983 when Major General Nizar Attar, the Director General of Project 922, received approval from the Minister of Defence to include biological R&D within the framework

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<sup>182</sup> This refers specifically to nuclear, biological, chemical weapons. Ballistic missiles fall outside the scope of this project.

<sup>183</sup> “Status of the Convention.” The Biological and Toxin Weapons Convention Website, accessed 12 March 2009, <http://www.opbw.org>.

<sup>184</sup> UNMOVIC Compendium, Chapter 5, 768.

<sup>185</sup> ISG Report, III, Biological Weapons Programme, 6.

<sup>186</sup> Ibid.



of CW activities.<sup>187</sup>

In 1985, the BW programme expanded to include R&D work, which was necessary for the production of agents on a laboratory scale.<sup>188</sup> Heading up the biological research team was British-educated microbiologist Rihab Taha. Taha proposed that research on *Bacillus anthracis*, and *Clostridium botulinum* could be undertaken.<sup>189</sup> The relative success that Iraq had in deploying CW against Iranian troops had altered their perception of the utility of non-conventional weapons. Over the next few years, Taha acquired reference strains of several pathogens from a number of sources. The American Type Culture Collection (ATCC) supplied quite a few different strains of *B. anthracis*, which was intended for use in their R&D programme.<sup>190</sup> In 1987 the BW programme moved from MSE to the TRC, Forensic Research Department (T-3), at Salman Pak in May, forming the key R&D facility of Iraq's former BW programme. The work was subsequently renewed at the new location in July 1987.<sup>191</sup> According to the UNMOVIC Compendium:

Most major aspects of the BW programme were developed at Salman Pak, including the research into additional bacterial agents and fungal toxins, scaling up of the agent production, initial production of some agents, toxicity tests using a broad range of animals on site, and filling of munitions for some field tests.<sup>192</sup>

The following year, construction on the new facility at Al Hakam, 60 kilometers southwest of Baghdad was completed. Al Hakam became the chief biological warfare agent production site for anthrax, botulinum toxin and *C. perfringens* when it began operations in 1989.<sup>193</sup> Also known as *C. welchii* in older literature, *C. perfringens* the causative agent of gas gangrene, a clostridial wound infection that damages muscle and impairs blood supply.<sup>194</sup> The typical biological effects are hemolysis, dermonecrosis and death.<sup>195</sup> The ISG Report states "Dr. Rihab Taha instructed the researchers to investigate the various strains and identify the most effective for use as a large-scale BW agent with

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<sup>187</sup> Iraq's Biological CAFCD, December 2002, Chapter 2.1.

<sup>188</sup> UNMOVIC Compendium, Chapter 5, 777.

<sup>189</sup> Ibid.

<sup>190</sup> ISG Report, III, Biological Weapons Programme, 9.

<sup>191</sup> UNMOVIC Compendium, Chapter 5, 779-780.

<sup>192</sup> Ibid.

<sup>193</sup> ISG Report, III, Biological Weapons Programme, 9.

<sup>194</sup> "Gas Gangrene and Related Clostridial Wound Infections – Medical Microbiology – NCBI Bookshelf." The National Center for Biotechnology Information, accessed 15 September 2010, <http://www.ncbi.nlm.nih.gov/bookshelf/br.fcgi?book=mmed&part=A1089>.

<sup>195</sup> Alan W. Bernheimer, "Cytolytic Toxins of Bacterial Origin," *Science* Volume 159 (23 February 1968): 847.

the intent of the research being the dissemination of *C. perfringens* as spores.”<sup>196</sup> Iraq had produced 340 litres of ten times concentrated spores of *C. perfringens* between August and November 1990, though none of the agent was ever weaponized.<sup>197</sup>

Weaponization of BW agents began in earnest in 1990. According to the UNMOVIC Compendium, in May 1990, a 400 kg aerial bomb – the R-400 – was certified, by the Iraqi Air Force command as suitable for the delivery of chemical and biological weapons.<sup>198</sup> After the invasion of Kuwait, Hussein Kamel ordered the production of 200 R-400 bombs as well as 25 Al Hussein warheads.<sup>199</sup> These two delivery systems were chosen as they had already been used successfully in the chemical programme.

With hostilities looming, the regime decided to pursue full BW weaponization. ISG states, “frenetic and convulsive efforts to adapt new weapons and acquire and expand BW agent production replaced the years of orderly progress.”<sup>200</sup> In November, the MSE facility started experimenting with made-for-aircraft auxiliary fuel tanks. Hussein Kamel advised Saddam Hussein that this would be the most effective method for delivering their biological slurries. The wording he used was, “Sir, the best way to transport this weapon and achieve the most harmful effects would come by using planes, like a crop duster, to scatter it. This is, Sir, a thousand times more harmful.”<sup>201</sup> Kamel had quite a bit of influence with Saddam and was able to get things done rapidly.<sup>202</sup> As well as thinking about delivery system issues, there was a need for a considerable amount of biological agent. For a few years the BW production facilities were engaged in production of multiple agents in slurry form, which is a watery mixture with characteristics closely resembling mud.<sup>203</sup> Slurry was easier to manufacture than finely milled powders. The process of drying BW agents like anthrax for aerosolization is technologically complex and Iraq had little to no success with the process.

When hostilities broke out in January 1991, Iraq’s biological programme had been in full production mode for a number of years. According to the ISG Report:

By January 1991, reflecting the huge exertion of the previous months,

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<sup>196</sup> ISG Report, III, Biological Weapons Programme, 22.

<sup>197</sup> UNMOVIC Compendium, Chapter 5, 783.

<sup>198</sup> Ibid., 788.

<sup>199</sup> Ibid.

<sup>200</sup> ISG Report, III, Biological Weapons Programme, 9.

<sup>201</sup> ISG Report, III, Biological Weapons Programme, 10.

<sup>202</sup> Interview with Svetlana Utkina, 30 March 2008.

<sup>203</sup> Raymond A. Zilinskas, “Iraq’s Biological Warfare Program: The Past as Future?” in *Biological Weapons: Limiting the Threat*, ed. Joshua Lederberg. (Cambridge: MIT Press, 2001), 143-144.

Iraq had produced large quantities of anthrax, botulinum toxin, *Clostridium perfringens*, aflatoxin, and small quantities of ricin, and had more than 180 BW weapons deployed to five hide sites. In addition, Al Hakam protected caches of bulk BW agent containers by moving them from site to site during the hostilities. The weapons and agent were guarded and ready for use. The Iraqi leadership decided policy for their use and targeting. Iraq states that the opening bombardment of 17 January 1991 destroyed the only aircraft and spray tank ready for use. Despite this, work continued to complete another three tanks, with plans for a further eight in preparation.<sup>204</sup>

Saddam had exercised considerable control over the biological weapons arsenal and was seemingly prepared to use any and all of his non-conventional weapons. He chose targets that he wanted to attack with BW. His first priority was Israel. Anything and everything was fair game, but Tel Aviv was to receive targeting priority.<sup>205</sup> US forces were also targeted, as were the Saudi Arabian cities of Riyadh and Jeddah. If Saddam was going to authorize the release of BW agents, he was going to use the full force of his arsenal. By the end of the conflict, Iraq had not used any of its biological or chemical weapons against Israel, Coalition forces or Saudi cities. Regime officials, including Saddam, believed that the threat posed by their CBW arsenal and delivery systems, prevented Coalition forces from entering and occupying Baghdad.<sup>206</sup> The preservation of the regime and himself as Iraqi President was his primary goal. Since the Coalition did not have the mandate to invade Iraq, the need to use CBW did not materialize. The threats were there, but in the end nothing came of it.

### *The UNSCOM Years*

The period immediately after the end of the First Gulf War was marked by continual Iraqi changes of opinion and intentions. As mentioned earlier, the chemical and missile programmes were known to western intelligence agencies, though the details regarding the size and scope of the programmes were less well known. There were some suspicions that Iraq was engaged in illegal nuclear activities and concerns that they were up to something on the biological side. Following Iraq's acceptance of UNSCR 687, they had fifteen days to make a declaration regarding their proscribed weapons programmes. In a letter to UN Secretary General Javier Pérez de Cuéllar, on 18 April, Iraqi Foreign Minister Tariq Aziz denied Iraq ever having a biological

<sup>204</sup> ISG Report, III, Biological Weapons Programme, 10.

<sup>205</sup> Ibid., 11.

<sup>206</sup> ISG Report, I, Regime Strategic Intent, 33.

weapons programme. Shortly thereafter, Baghdad decided at the political level to take measures to obliterate the entire BW programme and admit work on research and development only.<sup>207</sup>

According to the 1997 Full, Final and Complete Declaration Iraq declared that it destroyed all bulk biological warfare agent and munitions as well as removed all traces of production and supporting records, in the summer of 1991.<sup>208</sup> The destruction decision also covered munitions and remaining bulk agent. Implementation of the order began in June 1991 and continued until the end of July.<sup>209</sup> The regime claimed that, “equipment was thoroughly decontaminated or burnt; facilities were scrubbed down with appropriate decontaminants, sewage pits were cleansed, filters burnt, seed stock destroyed, some equipment and materials were removed and chemicals were used to inactivate biological material held in bulk storage or in weapons.”<sup>210</sup> When the first United Nations biological weapons inspection team arrived – led by British biologist David Kelly – in Iraq on 2 August, the cleanup had been completed and a somewhat adequate cover story was in place.<sup>211</sup>

When UNSCOM inspectors were finally able to begin inspecting Iraq’s suspected BW facilities in August 1991, no immediate evidence of bulk agent, filling equipment or chemical munitions were found.<sup>212</sup> Fortunately, UNSCOM inspectors did not abandon their search for the smoking gun. UNSCOM 15 was the second BW inspection team in Iraq and was led by veteran US BW expert David Huxsoll. From 20 September to 3 October this team inspected ten different declared and undeclared BW sites including Al Hakam and Salman Pak. It was the single cell protein plant at Al Hakam that gave the inspectors some cause for concern as it was thought that the facility might have been intended as “the next stage in a BW programme.”<sup>213</sup> There would only be one more BW inspection in 1991, and it did not uncover any relevant information. The following May Iraq provided its first Full, Final and Complete Disclosure (FFCD) of its

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<sup>207</sup> UNMOVIC Compendium, Chapter 5, 790.

<sup>208</sup> Iraq’s Biological Full, Final and Complete Disclosure (FFCD) September 1997, Chapter 6.5.1, cited in UNMOVIC Compendium, Chapter 5.

<sup>209</sup> Ibid.

<sup>210</sup> Ibid.

<sup>211</sup> Trevan, *Saddam’s Secrets*, 21-29.

<sup>212</sup> “UN Special Commission BW Inspections in Iraq: Lessons for the Ad Hoc Experts’ Group on Verification (30 March – 10 April 1992),” Working Paper Submitted by the UK to the first session of the Ad Hoc Group of Governmental Experts to Identify and Examine Potential Verification Measures from a Scientific and Technical Standpoint. Biological Weapons Convention, Third Review Conference, BWC/CONF.III/VEREX.WP5, 6.

<sup>213</sup> Ibid., 10.

prohibited biological and missile programmes. In it they admitted to having had only a biological weapons programme for "defensive purposes only."<sup>214</sup>

Since they had claimed that their biological programme that was purely defensive and since they took steps to destroy their munitions and bulk agent, inspectors were left with little in the way of concrete evidence. Some of the Iraqi scientists that were being interviewed were describing things that, to the UNSCOM inspectors, did not add up to a purely defensive BW programme. The only real evidence they had was what you could call "negative evidence"<sup>215</sup> and they had to try and reconstruct the BW programme from a sanitized set of documents, missing equipment and components and deceptive interview data. The UNMOVIC Compendium states that:

Through the period of UN inspections (1991-1996), Iraq changed its declarations several times. Although UN inspectors were able to verify much of what Iraq declared from a qualitative perspective, they were unable to do so from a quantitative perspective. Neither the UN nor the ISG have found any evidence of remaining bulk agent or filled BW munitions, however some personnel involved in the past BW programme did declare to the ISG a new location for destroyed and dumped agent.<sup>216</sup>

What ended up tipping the balance was Iraq's acceptance of UNSCR 715 on 26 November 1993. This Resolution laid the out the framework for setting up the ongoing monitoring and verification of Iraqi compliance. Article 2 of UNSCR 715 stated that:

In the first three months of the period under review, developments were not generally positive. Iraq remained adamant in its refusal to acknowledge, during the period covered by the report, its obligations under resolution 715 (1991) and the plans approved thereunder. However, in the last three months, there has been a positive change of attitude on the part of Iraq. The report, in order to be comprehensive, has to cover the entire period and should be read in that light.<sup>217</sup>

At this point, Baghdad took steps to hide the remnants of its proscribed BW programme, but did not give up on the idea that it could and should be restarted once the inspection regime was over.<sup>218</sup> The ISG Report states, "The overall strategic objective was to give the appearance of cooperation while preserving its previous intellectual

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<sup>214</sup> "UNSCOM Chronology December 1999." United Nations, accessed 22 March 2009, <http://www.un.org/Depts/unscom/Chronology/chronologyframe.htm>.

<sup>215</sup> Interview with Amy Smithson, 4 April 2008.

<sup>216</sup> UNMOVIC Compendium, Chapter 5, 791.

<sup>217</sup> "United Nations Security Council Resolution 715." United Nations, accessed 20 July 2010, <http://www.un.org/Docs/scres/1991/scres91.htm>.

<sup>218</sup> ISG Report, III, Biological Weapons Programme, 13.

capital.”<sup>219</sup> This was to be the focus for the Iraqi regime up to 1995 and the defection of Hussein Kamel.

When Kamel defected, a great deal of information regarding the covert BW programme came to light. He was officially denounced as a traitor to the regime and every effort was made to place blame on him – to make him the proverbial fall guy. If Baghdad could convince UNSCOM that Kamel was unilaterally responsible for the maintenance of the BW programme, then maybe inspections would cease and sanctions would be lifted. The idea of having sanctions lifted would be one of the major focal points for the Iraqi regime. Having sanctions lifted would mean more money in from the sale of oil and it would be possible to attempt a restart of the covert BW programme. For the regime it was all-important that sanctions be lifted.<sup>220</sup> And Baghdad knew that anything could happen once the money started flowing again and UNSCOM was out of Iraq.

#### **REGIME DECISION-MAKING**

Throughout the 1980s and early 1990s all major decisions relating to the development of nuclear, biological and chemical weapons went through Saddam Hussein. The ISG Report states that, “Saddam dominated all Iraqi institutions by the early 1990s and increasingly administered by personal direction.”<sup>221</sup> This is true for most authoritarian and dictatorial regimes and Saddam was a dictator in every sense of the word. Saddam took special interest in issues of state security and military matters. He was the sole decider of the regime’s strategic intent. He had consolidated his power in such a way that there were no real internal threats to his leadership. His ability to nurture fear and obedience in his subordinates was frightening. He made sure that he would stay involved in every aspect of the regime so much so that by the time of Operation *Desert Storm* his titles were, President, Prime Minister, Chairman of the Revolutionary Command Council (RCC), General Secretary of the Ba’th Party, Commander in Chief of the Armed Forces as well as appointing himself “paramount sheikh” in hopes of dominating Iraq’s important and influential tribal system.<sup>222</sup> His word was the only word that mattered.

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<sup>219</sup> Ibid.

<sup>220</sup> Interview with Rod Barton, 24 April 2008.

<sup>221</sup> ISG Report, I, Regime Strategic Intent, 5.

<sup>222</sup> Ibid.

Saddam thought of himself as the most recent in a line of great warrior-hero Iraqi leaders – Sargon of Akkad, Hammurabi, Nebuchadnezzar and Saladin, one who will stand up to and fight, the Persians, the Israelis, whomever.<sup>223</sup> During the Iran-Iraq War Saddam had reconstructed Nebuchadnezzar's palace in the ancient city of Babylon on the river Euphrates, right on top of the ancient foundation. Since the original brickwork bore inscriptions lauding Nebuchadnezzar, the 60 million odd new sandstone bricks would also contain similar inscriptions, such as, "In the era of Saddam Hussein, protector of Iraq, who rebuilt civilization and rebuilt Babylon."<sup>224</sup> He saw Iraq as the leading player in that part of the world, with himself firmly in control of a great modern empire.<sup>225</sup> His vision was the only vision for Iraq.

Iraq under Saddam had all the formal decision-making structures and staff of a modern state, president, national assembly, judiciary, civil service, but they were not involved in making or directing national strategic policy. In western-style democracies these institutions were the "organs of power" but in Saddam's Iraq they were largely cosmetic – they gave the impression that Iraq was an evolved political state, complete with archetypal albeit nominal western democratic political institutions.<sup>226</sup> Many Iraqi technocrats had been schooled in the British post-secondary education system. While there was a finance minister, a health minister among others, by western standards, Iraq's institutions were largely ineffective and superfluous.<sup>227</sup> Social control mechanisms tend to be important and a lot of the vestiges of a democratic society were inherited when the Ba'th Party came to power. The need for the Ba'thists to establish some form of political and social legitimacy was key, so they had elections, created parliament, among others. It was one of the many pillars of support for the regime similar to the old tribal relationships that had been the norm for centuries and these traditional tribal relationships were just as important as any modern structures, perhaps more important.<sup>228</sup>

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<sup>223</sup> Interview with Charles Duelfer, 10 April 2008; Interview with Ewen Buchanan, 31 March 2008; Interview with a Senior UNSCOM Official, 31 March 2008.

<sup>224</sup> Colin Freeman, "Saddam Hussein's Palaces." *The Telegraph*, 16 July 2009, accessed 4 December 2010, <http://www.telegraph.co.uk/news/worldnews/middleeast/iraq/5824615/Saddam-Husseins-palaces.html>; Jackie Craven, "Saddam's Babylonian Palace." About.com: Architecture, accessed 4 December 2010, <http://architecture.about.com/cs/countriescultures/a/saddamspalace.htm>.

<sup>225</sup> Interview with Tim Trevan, 5 April 2008; Interview with Charles Duelfer, 10 April 2008.

<sup>226</sup> ISG Report, I, Regime Strategic Intent, 18.

<sup>227</sup> Interview with Charles Duelfer, 10 April 2008.

<sup>228</sup> Interview with Seth Carus, 3 April 2008.

Former ISG head Charles Duelfer believes that within Iraq there existed a number of parallel organizations that were all inextricably linked to the mechanisms of Iraq's internal workings.<sup>229</sup> He states that:

In addition to the technocratic or bureaucratic organizations there was a parallel Ba'th Party organization where the influence of the leadership ran in parallel to all the other hierarchical levels. At the same time parallel to that were the security organizations. It was almost like you had a circulatory system with one set of vessels and then parallel to all those you have the Ba'th Party organs and parallel to all those you have these security organs and those other elements tended to be run by Saddam's inner circle.<sup>230</sup>

With these different groups all involved in the decision-making process, it is a little more difficult to trace exactly how things functioned in Baghdad. Western analysts would look at the situation in Iraq and immediately want to create a block diagram or a system of flow charts to try and explain how the regime worked. The problem with that is you would have to draw multiple charts to illustrate this phenomenon. According to Duelfer, "The difficulty would be to translate that which is obvious to an Iraqi to someone in the West and I would say that the Iraqis were always much better looking at us then we were at them."<sup>231</sup>

One of the problems with looking at regime decision-making in Iraq is the concept of mirror imaging. This is an institutional bias that can have a detrimental effect when trying to understand a particular set of phenomena. It is the tendency to assume that all actors in the international system will act in the same way and for largely the same reasons.<sup>232</sup> You think that something cannot possibly be what someone says it is because that is not the way you would do it. In the case of Iraq and its NBC weapons programmes, mirror imaging caused UN inspectors and analysts quite a bit of concern. For example, looking at the way in which Iraq approached chemical and biological safety precautions was a problem the inspection teams encountered once they gained access to Iraq's production facilities. They would see something that resembled a CW munitions filling station but it was bereft of basic safety protocols, *ergo* it must not be a

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<sup>229</sup> See Appendix 6: Integrated Management of Iraq's WMD Programmes.

<sup>230</sup> Interview with Charles Duelfer, 10 April 2008.

<sup>231</sup> Ibid.

<sup>232</sup> Scott D. Sagan, "The Origins of Military Doctrine and Command and Control Systems," in *Planning the Unthinkable: How New Powers will Use Nuclear, Biological and Chemical Weapons*, ed. Peter R. Lavoy, Scott D. Sagan and James J. Wirtz. (Ithaca: Cornell University Press, 2000), 17.



filling station. This is based on the presumption that they had some concept of the health and safety aspect, which they clearly did not.<sup>233</sup>

It was the same regarding the BW programme. Many of the facilities that were inspected were also lacking in safety protocols. One possible reason for this is that biosafety is less of a concern when working with slurries as opposed to finely milled powders.<sup>234</sup> And Iraq had invested heavily in the production of slurries. According to Ewen Buchanan, “We were trying to expose these programmes by looking at them through a prism that was not applicable to Iraq at that age and stage.”<sup>235</sup> As a result, facilities such as Al Hakam, which was initially passed off as a single cell protein production plant, caused problems as few clear fingerprints of an active BW R&D programme were found.

As a result of western mirror imaging a significant knowledge gap can exist between some strategic cultures and our capacity to understand them.<sup>236</sup> Saddam’s Iraq was no different. Iraq was still what would be classified as a developing nation when Saddam came to power. Iraq was a poor, under-developed country. Basic services were lacking. There were not any paved roads.<sup>237</sup> This all changed. Saddam brought Iraq into the twentieth century. He nationalized the oil industry. He constructed roads. He created jobs. He built up the armed forces and almost single-handedly created Iraq’s large military-industrial complex.<sup>238</sup> To judge Iraq’s progress by western standards is flawed, as it is not a fair comparison. But by the standard of the region, Saddam made Iraq a more advanced society.<sup>239</sup>

One of the interesting things about the Iraqi regime was that in certain areas there did appear to be a formalized decision-making process. Iraq had inherited a highly organized and bureaucratic system from Britain, which was a remnant of the British Mandate of Mesopotamia after the First World War.<sup>240</sup> According to Duelfer, this was most notable in the area of regime finance until it was subverted by the regime in the 1970s.<sup>241</sup> The “legitimate” financial system that Iraq used to support government ministries was highly bureaucratic and tightly controlled by the Presidential Diwan. ISG

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<sup>233</sup> Interview with Tim Trevan, 5 April 2008.

<sup>234</sup> Interview with Amy Smithson, 4 April 2008.

<sup>235</sup> Interview with Ewen Buchanan, 31 March 2008.

<sup>236</sup> Interview with Brad Roberts, 7 April 2008.

<sup>237</sup> Interview with a Senior UNSCOM Official, 31 March 2008.

<sup>238</sup> Ibid.

<sup>239</sup> Ibid.

<sup>240</sup> Interview with Charles Duelfer, 10 April 2008.

<sup>241</sup> Ibid.

states that the Presidential Diwan was set up in 1979 as a purely administrative body to research and study specific issues requested by the President, the Council of Ministers, the Economic Affairs Committee, and the RCC.<sup>242</sup> The Diwan had a role to play in the regime's illicit procurement activities, however, "Saddam approved and directed the illicit procurement relationships that Iraq had with other countries in order to improve Iraq's military capabilities against regional threats."<sup>243</sup>

Following Operation *Iraqi Freedom* in 2003, the ISG was able to procure a considerable amount of information relating to the "economic means, key actors and organizations, foreign suppliers, and procurement mechanisms used by Saddam to pursue his set of objectives: survival of himself, his Regime, and his legacy."<sup>244</sup> Much of the business inside Iraq was directed by Baghdad, though not Saddam personally, but ISG found that in some cases, certain firms and organizations had engaged in illicit activities without the government's knowledge. This was the case with many Iraqi and foreign trade intermediaries' methods that were used to procure UN-banned items.<sup>245</sup> Included within this section of the ISG Report are twelve annexes that are intended to provide more detail on the issues examined in the procurement chapter. These annexes range from translations of Iraq's major trade protocols to a description of its banking system to companies suspected in illicit military-related trade with Iraq.<sup>246</sup> While much information was obtained relating to regime finance, issues relating to decision-making of Iraq's proscribed weapons programmes were less forthcoming.

The climate in which NBC weapons decisions were made changed considerably with Iraq's invasion of Kuwait. Before 1990 NBC decisions were made for national prestige concerns and tended to revolve around the nuclear programme. Baghdad paid little attention to comments made by the West concerning the development of NBC weapons, as many regime officials believed the effective use of chemical weapons was the sole reason they were not speaking Persian in the 1990s.<sup>247</sup> After the Kuwait war the key operative international concern was the implementation of the ceasefire resolution, UNSCR 687, which obligated Iraq to fully account for its NBC programmes before relief on the sanctions would be allowed. This quickly became the focus of the regime and there was an evolution in the Iraqi approach with the objective being the lifting of

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<sup>242</sup> ISG Report, I, Regime Finance and Procurement, 12.

<sup>243</sup> *Ibid.*, 11.

<sup>244</sup> *Ibid.*, 7.

<sup>245</sup> *Ibid.*

<sup>246</sup> *Ibid.*

<sup>247</sup> Interview with Steve Black, 8 April 2008.

UN sanctions. Saddam had placed a great deal of his reputation on the production of these weapons and it was important that Iraq be able to reconstitute its proscribed weapons programmes at the earliest possible date.<sup>248</sup> This would not be able to happen until sanctions were lifted and UN inspectors had signed off on Iraq's compliance.

In terms of NBC weapons decision-making, there did not seem to be any sort of formalized process. The western construct of governmental decision-making did not exist. According to Steve Black:

The thing we (ISG) never got a good handle on is some notion of an organized set of committees, or some sort of inter-agency process. It's easy enough to make a wire diagram of who was in charge of what project but the formal decision-making was really amorphous. We don't understand it, not because they weren't willing to try to explain it. Stuff would get stove-piped upwards. There was not a WMD committee with a representative of each program, etc, who would sit together every other week and decide where the effort should go. They didn't do it that way. It was impossible to explain how they made decisions, by using that sort of formalized construct.<sup>249</sup>

Having inherited an administrative system from the British, many government officials were meticulous bureaucrats, or at least this was the case until this orderly process was subverted by the regime.<sup>250</sup>

Saddam was a dictator, plain and simple. And in any dictatorship, the organs of democratic process – if present – will invariably be little more than window dressing. Saddam was the primary decision-maker in the regime and he was responsible for setting the regime's strategic goals. That is not to say that other people were irrelevant. Since Saddam had little to no scientific and technical understanding of the various programmes, he relied on the opinions of a few of his favoured technocrats.<sup>251</sup>

Of interest were Iraq's R&D efforts into aflatoxin. For example, you might have a scientist whose area of research was aflatoxin and figured this was an easy way to get support for something the leadership did not understand and that did not seem to provide any real benefit to the CB programme.<sup>252</sup> People in these programmes were maneuvering in the space that Saddam left open to work. Iraq under Saddam was a country that did not allow other people the autonomy to independently make decisions

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<sup>248</sup> Interview with Charles Duelfer, 10 April 2008.

<sup>249</sup> Interview with Steve Black, 8 April 2008.

<sup>250</sup> Interview with Charles Duelfer, 10 April 2008.

<sup>251</sup> Saddam kept three scientific advisors on his staff: Amir Al Saadi, former deputy director at MIC, Amir Rashid, former Minister of Oil and Ja'far Diya' Ja'far, former head of PC-3. ISG Report, I, Regime Strategic Intent, 20.

<sup>252</sup> Interview with Seth Carus, 3 April 2008.

apart from him. Many ideas were brought to Saddam's attention, ideas which were usually dealt with at a much lower administrative level. According to Black, "There is a weird dynamic where little things wind up further up the chain but the big decisions get made at a very low level."<sup>253</sup> This was the situation in Saddam Hussein's Iraq.

According to ISG, early in his career Saddam was very involved in the micromanagement of all aspects of government. Later on he became more withdrawn and less involved in the day-to-day running of regime affairs. Though Saddam ruled as a dictator, he did not involve himself with the minutiae of running the proscribed weapons programmes.<sup>254</sup> Saddam would not have been interested nor able to make a rational decision regarding which method of uranium enrichment to follow or specific bomb designs or what pathogens to weaponize. He may have made comments, which were either implicit or explicit as to what he wanted, and it was up to his scientists and technocrats to come up with the solutions. Saddam did not delegate as he had others to do that for him. His son-in-law, Hussein Kamel was one of the most prominent of his managers and was a key figure in the administration of Iraq's proscribed weapons programmes.

### *Iraqi Economics*

For decades the economy of Iraq has been linked to the welfare of its energy sector, specifically oil production.<sup>255</sup> Currently Iraq has proven oil reserves upwards of 115 billion barrels meaning that it possesses the second largest oil reserves in the world behind Saudi Arabia.<sup>256</sup> One year after the ascent of Saddam Hussein to the Presidency, Iraq's income from the sale of oil was about \$26 billion.<sup>257</sup> During the latter stages of the war with Iran, Iraqi oil revenue was approximately \$11 billion, well under half of its 1980 level.<sup>258</sup> Two years later, Saddam Hussein would initiate plans to invade neighboring oil-rich Kuwait, believing that along with the UAE, Kuwait had

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<sup>253</sup> Interview with Steve Black, 8 April 2008.

<sup>254</sup> Interview with a Senior UNSCOM Official, 31 March 2008.

<sup>255</sup> See Appendix 7: Crude Oil Production – Iraq.

<sup>256</sup> Lawrence Kumins, "Iraq Oil: Reserves, Production, and Potential Revenues," *CRS Report for Congress*, 13 April 2005, 1.

<sup>257</sup> Eliyahu Kanovsky, "Economic Implications for the Region and World Oil Market," in *The Iran-Iraq War: Impact and Implications*, ed. Efraim Karsh. (London: Macmillan and St Martin's Press, 1989), 231-32.

<sup>258</sup> For six years, beginning in 1982 Iraqi oil revenue (in billions of US dollars) was estimated to be \$10.25, \$9.65, \$10.00, \$11.9, \$6.813 and \$11.3. "Country Studies, Area Handbook Series, Iraq – Tables. Crude Oil Production and Oil Revenues, 1982-87." Library of Congress, Federal Research Division, accessed 24 April 2010, [http://lcweb2.loc.gov/frd/cs/iraq/iq\\_appen.html#table6](http://lcweb2.loc.gov/frd/cs/iraq/iq_appen.html#table6).

intentionally flooded the market with a quantity of oil that exceeded the quotas fixed by OPEC. The drop in oil prices amounted to a net loss of \$89 billion for Iraq.<sup>259</sup> The regime also claimed that Kuwait had stolen oil valued at approximately \$2.4 billion from Iraq via the setting up of oil installations in the southern section of the Iraqi Rumalia oil field.<sup>260</sup> The regime was going to extract payment from Kuwait one way or another.

The volatility in the price of oil caused significant economic issues for the regime in the 1980s. This was a problem as it was estimated that in 1989 the sale of oil comprised about 61% of Iraq's GDP.<sup>261</sup> This affected Iraq's revenue stream, though it did not seem to have a discernable effect upon the amount of money going into the proscribed weapons programmes. Another issue of significance was that Saddam had grossly underestimated the financial cost of the eight-year war with Iran<sup>262</sup> – a mistake he would make later on with the 1990 invasion of Kuwait. The ISG Report states:

Saddam ignored his economic advisors in the Ministries of Finance and Planning with respect to strategic planning. For example, Saddam entered the Iran-Iraq war heedless of Ministry warnings about the economic consequences. He had no plan or strategy for how the war was to be financed and generally displayed little interest in economic policy. He showed little concern about adjusting disastrous economic policies (such as those causing inflation) in the interests of social stability. He did, however, pay close attention to disbursements. He made sure he could take the credit for public sector pay raises or special allocations such as bonuses to particular sections of the Iraqi population. He took less interest in whether such outlays were affordable or their effect on fiscal management.<sup>263</sup>

Beginning in 1991 strict economic sanctions were imposed by the UN Security Council limiting the import/export ability of the regime. Since Iraq was heavily dependent upon the export of oil, this became a significant issue. According to the ISG Report, GDP per capita fell from \$2304 in 1989 to approximately \$495 in 1995.<sup>264</sup> This had a significant impact upon Iraqi society as it effectively destroyed any savings people may have had and pushed the once-prosperous Iraqi middle-class into crippling

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<sup>259</sup> Efraim Karsh and Inari Rautsi, "Why Saddam Hussein Invaded Kuwait," *Survival*, Volume 33, Number 1 (1991): 25.

<sup>260</sup> Lawrence Freedman and Efraim Karsh, *The Gulf Conflict, 1990-1991: Diplomacy and War in the New World Order* (Princeton: Princeton University Press, 1993), 48.

<sup>261</sup> ISG Report, I, Regime Finance and Procurement, 207.

<sup>262</sup> It is estimated that the war with Iran cost Iraq in the neighborhood of \$150 billion. ISG Report, I, Regime Strategic Intent, 41.

<sup>263</sup> *Ibid.*, 18.

<sup>264</sup> ISG Report, I, Regime Finance and Procurement, 9.

poverty.<sup>265</sup> During this time, Iraqi officials were desperate to have sanctions lifted and resume the unregulated sale of oil. They had exported a quantity of oil illegally, but it was far below their pre-sanctions OPEC quota. The Iraqi economy eventually stabilized in 1996 when the regime formally accepted UNSCR 986 and the establishment of the UN Oil for Food Programme.<sup>266</sup>

The inspection regime set up by the UN after the acceptance of UNSCR 687 had been met with strong resistance and continual denial from the beginning. Iraqi government officials were trying to cooperate just enough so that inspectors could sign off on Iraqi compliance. This was the regime's desired end result. Everything depended on sanctions being lifted. Restarting the chemical and biological weapons programmes was not going to be easy, especially considering the invasive nature of the UN inspection regime. This was key for the regime – get the UN to sign off on compliance, lift sanctions, carry on with the sale of oil and eventually restart the proscribed weapons programmes. Iraq had retained a significant amount of its scientific and technical expertise in research laboratories and universities.<sup>267</sup> Restarting the programmes would have been completely dependent on the lifting of sanctions and having the inspectors out of Iraq. Charles Duelfer believes that in early 1991 firm guidance was given by Saddam to make the lifting of sanctions the highest priority. Duelfer also believes that this was the case because so much of Saddam's reputation was tied to the production of WMD.<sup>268</sup>

UNSCOM was resolute in its opinion that the On-Going Monitoring and Verification (OMV) regime that was required by Security Council Resolution 715 be quickly implemented. The resolution contained “specific provisions for the monitoring and verification of any eventual imports by Iraq, including lists of prohibited items as well as dual-use items.”<sup>269</sup> The Security Council also requested that UNSCOM and the IAEA develop a mechanism for monitoring any eventual sales or supplies to Iraq of items relevant to the implementation of provisions of Resolution 687.<sup>270</sup> A Senior UNSCOM official has stated that the regime was thinking that sooner or later the inspection regime would be removed and that is why they fought for so long against the

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<sup>265</sup> Ibid.

<sup>266</sup> UNSCR 986 enabled Iraq to sell up to \$1 billion worth of oil every 90 days and use the proceeds for humanitarian supplies to the country. Ibid. 257.

<sup>267</sup> Interview with Tim Trevan, 5 April 2008.

<sup>268</sup> Interview with Charles Duelfer, 10 April 2008.

<sup>269</sup> UNMOVIC Compendium, Chapter 6, 1039.

<sup>270</sup> Ibid.

acceptance of a monitoring protocol.<sup>271</sup> This would have made things even more difficult in restarting the weapons programmes. However, on a small-scale, the CB programmes could be reasonably well hidden from the inspectors. Former UNSCOM official Tim Trevan believes it would have been possible for them to restart their chemical and biological weapons programmes since Iraq had retained the scientific “know-how” and could have learned from their previous mistakes in weapons production.<sup>272</sup>

In order to help conceal the regime’s expenditures on their proscribed weapons programmes, a special budgetary process was developed. This process was divided into two systems, the first was a formal governmental budget and the second was a supplemental budget that was controlled directly by Saddam and the Economic Affairs Committee.<sup>273</sup> The supplemental budget used hard currency to finance Iraq’s illicit procurement programmes. The report estimates that the regime generated \$10.9 billion in hard currency through illicit means from 1990 to 2003.<sup>274</sup> The primary source of Iraq’s income came from their Bilateral Trade Protocols with neighboring states. For example, ISG claims that the Protocol with Jordan gave the regime an estimated \$8 billion in revenue from the illicit sale of oil.<sup>275</sup> Though this was less in terms of total dollars earned from the sale of oil, it was enough to keep R&D into Iraq’s proscribed weapons programmes funded.

### *Byzantine Bureaucratic Politics*<sup>276</sup>

Key players within the bureaucratic politics model are not passive actors in the policy-making process. Typically they do more than accept decisions from above and implement them. Saddam consulted a few long-serving advisors, but large deliberative bodies like the RCC, the Ba’th Party leadership, Cabinet Ministries, the military or the intelligence agencies and the industrial establishment were incidental to critical decisions. He chose to not give these organizations an active role in the policy process, instead preferring to direct policy via his own fiat.<sup>277</sup> One man ruled with an iron fist

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<sup>271</sup> Interview with a Senior UNSCOM Official, 31 March 2008.

<sup>272</sup> Interview with Tim Trevan, 5 April 2008.

<sup>273</sup> ISG Report, I, Regime Finance and Procurement, 11.

<sup>274</sup> *Ibid.*, 19.

<sup>275</sup> *Ibid.*, 24.

<sup>276</sup> The term Byzantine is defined here as excessively complicated, typically involving a great deal of administrative detail.

<sup>277</sup> ISG Report, I, Regime Strategic Intent, 7.

and was unilaterally responsible for directing overall regime strategy. Everything was autocratic at all levels.<sup>278</sup> Decision-making in Iraq was amorphous and idiosyncratic and devoid of any formalized western-style logic and reasoning. It consisted of a complex web of personal interests, loyalty to the regime and fear of consequence.

According to Avinash Dixit, “Democratic and autocratic rulers alike must use a bureaucracy to implement policy.”<sup>279</sup> Saddam placed a lot of importance on what some of his most senior advisors told him, most of whom were kept duly informed through a well-defined scientific and civil service. Most of his advisors, upon receiving approval to debate a particular military or foreign policy issue would spend their time trying to figure out what Saddam wanted to hear, as opposed to what may or may not be the most logical course of action. This was in fact commonplace in weapons-related issues, where no one wanted to be the bearer of unpleasant or unwanted news for fear of being ultimately blamed for its failure. In 1991, Saddam created a committee to serve as a deliberative body to provide political advice. The committee, called the Political Operations Room included Foreign Minister Ahmad Husayn Khudayr Al Samarra’i, Prime Minister Sa’dun Hamadi, Tariq Aziz and either Latif Nusayyif Jasim Al Dulaymi or Hamid Yusif Hammadi.<sup>280</sup>

Prior to the creation of the Political Operations Room, Saddam had a system where he met with his ministers individually to discuss pressing political matters. In 1996 Saddam had replaced the Political Operations Room with a new committee called the Committee of Four or simply “The Quartet”.<sup>281</sup> The ISG estimates that:

Neither the Political Operations Room nor the Quartet had a policymaking role. Instead, they offered advice, but only on issues referred to them by Saddam. They had none of the proactive or directive powers normally associated with such senior committees in the West or elsewhere. Moreover, they were weakened by the Byzantine administrative practices common to the higher levels of the Regime.<sup>282</sup>

Other organizational bodies such as the RCC also debated policy issues, though it amounted to little more than a *post hoc* endorsement of Saddam’s already pre-determined decision.

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<sup>278</sup> Interview with Steve Black, 8 April 2008.

<sup>279</sup> Avinash K. Dixit, “Democracy, Autocracy, and Bureaucracy,” *Journal of Globalization and Development*, Volume 1, Number 1 (2010): 1.

<sup>280</sup> ISG Report, I, Regime Strategic Intent, 15.

<sup>281</sup> Ibid. This new committee consisted of Izzat Ibrahim al Duri, who served as the informal chair, Tariq ‘Aziz, Vice President Taha Yasin Ramadan and Ali Hasan Al Majid.

<sup>282</sup> Ibid.



One of the central tenets of bureaucratic politics is that there is no single, unitary actor making strategic decisions, but many actors as players who:

act in terms of no consistent set of strategic objectives but rather according to various conceptions of national, organizational, and personal goals; players who make government decisions not by a single rational choice, but by the pulling and hauling that is politics.<sup>283</sup>

In terms of nuclear, biological and chemical weapons decision-making, while Saddam had the final say in all decisions, his core group of advisors was involved in discussions to determine what the desired outcome of an issue should be. It was a matter of self-preservation for many senior government officials, military leaders and bureaucrats that they provide Saddam with what they thought was a viable option, one that would bring glory to Iraq and its leader.

Iraq had invested time and resources in at least three separate programmes to enrich uranium, EMIS, gas centrifuge technology and LIS. The gas centrifuge programme, run by Mahdi Obeidi, was under the direct supervision of Hussein Kamel. Ja'far Diya' Ja'far was the head of Iraq's pre-1991 nuclear weapons programme and the scientist charged with overseeing the EMIS enrichment programme. These two programmes were in effect competing with each other, though few would have known of the other's existence. Intended competition that resulted from two competing and separate groups occurred in other areas of Iraq's proscribed weapons programmes. For example, the regime had two competing ballistic missile programmes under Ra'id Jasim Isma'il Al Adhami and Muzhir Sadiq Saba' Al Tamimi in 1994, as well as the development of two different binary CW rounds at MSE and TRC in the late 1980s.<sup>284</sup>

This was particularly important for Kamel as he had a seat at the highest table and was one of the chief advisors to Saddam on military science and technology matters. It would have been in Kamel's best interest to be the one to bring Saddam the news that they were successful in building a gas centrifuge capable of enriching uranium. With a high premium placed on the development of nuclear weapons, and the way in which Saddam chose to remunerate his loyal servants, being the de facto head of the programme that was able to enrich uranium would have meant cars, money and untold privilege within the regime.

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<sup>283</sup> Graham T. Allison and Philip Zelikow, *Essence of Decision: Explaining the Cuban Missile Crisis* (New York: Longman, 1999), 255.

<sup>284</sup> ISG Report, I, Regime Strategic Intent, 9; "UNMOVIC Draft Work Programme, 17 March 2003." United Nations, accessed 5 November 2010, [http://www.un.org/Depts/unmovic/new/documents/draft\\_work\\_programme.pdf](http://www.un.org/Depts/unmovic/new/documents/draft_work_programme.pdf).

Many governments, autocratic and democratic alike, have individuals that are closely involved in the creation and implementation of policy. Some have more freedom and latitude than others, but what is consistent, as Allison argues, is how interpretations of national, organizational and personal goals influence each individual's outlook on a specific policy issue. Hussein Kamel was not a man of science, but he was a shrewd operator when it came to regime politics. Like many, Kamel operated without a specific set of strategic objectives. He was guided by his own personal agenda, which in many instances was intertwined with that of the regime. This is not to say that personal agendas are the sole motivating factor, however, different individuals will certainly have diverse reasons for their actions/opinions.

The Iraqi regime did not operate as a stable western democracy, and as we have seen, many of the organs of government were largely superfluous to decision-making and policy formation. While there were debates at high levels between regime officials, Saddam would sometimes act unilaterally on a particular issue, without consulting anyone. More often, he relied on a few individuals to give him updates and details over weapons development issues.

One of the key criticisms of the bureaucratic politics model is how the power of the chief executive is marginalized. Stephen Krasner states that:

Bureaucratic theorists imply that it is exceedingly difficult if not impossible for political leaders to control the organizational web which surrounds them. Important decisions result from numerous smaller actions taken by individuals at different levels in the bureaucracy who have partially incompatible national, bureaucratic, political, and personal objectives.<sup>285</sup>

Saddam did not solicit advice from many individuals on many issues and frequently the advice he did receive was based primarily on a sense of self-preservation and favoritism. Since no one wanted to bring Saddam bad news, the Iraqi President rarely had all the facts and this contributed to him making decisions that ended up being problematic. Former Iraqi defence scientist Imad 'Abd-al-Latif Abd-al-Ridha claimed that key regime members habitually concealed from Saddam the truth regarding Iraq's military and industrial capabilities.<sup>286</sup> This deception was most likely motivated through each individual's fear of loss – loss of privilege, loss of freedom and in some instances, loss of life. Abd-al-Ridha also stated that, "Saddam was like a computer, if he received

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<sup>285</sup> Stephen D. Krasner, "Are Bureaucracies Important? (Or Allison Wonderland)," *Foreign Policy*, Number 7 (Summer 1972): 159.

<sup>286</sup> ISG Report, I, Regime Strategic Intent, 11.

reliable information he would make good decisions, but if the inputs were flawed, the resulting policies would suffer.”<sup>287</sup> Having all the facts is a pre-requisite for making sound, rational decisions.<sup>288</sup> The ISG Report states that Saddam rarely had the whole story as none of his advisors or senior regime officials wanted to bring him bad or negative news for fear for their personal safety.<sup>289</sup>

The regime’s decision to invade Kuwait prior to the acquisition of a nuclear weapon, which was estimated to be between four and six months<sup>290</sup> made little sense from a western perspective. The crash programme was developed in August 1990 for the express purpose of diverting safeguarded reactor fuel towards the nuclear bomb programme.<sup>291</sup> Had the decision to invade Kuwait been delayed long enough for PC-3 to fashion some sort of nuclear device, then the situation in the region would have changed dramatically. Instead, they pushed ahead with the invasion and occupation without the security of a functional and deployable nuclear device.

Since the proposal of the bureaucratic politics decision-making model in the early 1970s, there has been both praise and criticism. For some, the model provided a further level of analysis into governmental decision-making – where many actors are involved in the policy process as opposed to a select few. This was in contrast to the rational actor model, which, over time, had become the preferred decision-making model, due primarily to its ability explain decision-making as the state acting as a unitary actor. The problem with the rational actor model according to Allison, is that:

The ‘maker’ of a governmental policy is not one calculating decision-maker, but rather a conglomerate of large organizations and political actors who differ substantially about what their government should do and who compete in attempting to affect both governmental decisions and the actions of the government.<sup>292</sup>

The bureaucratic politics model, according to Edward Rhodes, represents a sophisticated effort to deal with the fact that the “simplistic rational unitary-actor models of state behaviour failed to predict the complex, frequently inconsistent or self-

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<sup>287</sup> Ibid.

<sup>288</sup> Refer to Appendix 1.

<sup>289</sup> During the interrogation of former Chief of the Iraqi Intelligence Service, Ali Hasan Al Majid, the question was posed to him regarding Saddam’s treatment of people who brought him bad news – Al Majid responded that he did not know, leading ISG to surmise that, “Ali Hasan Al Majid has never known any instance of anybody bringing bad news to Saddam.” ISG Report, I, Regime Strategic Intent, 11.

<sup>290</sup> Interview with Tim Trevan, 5 April 2008; Interview with Leonard Spector, 7 April 2008.

<sup>291</sup> 1997 IAEA Report, 17.

<sup>292</sup> Graham T. Allison and Morton H. Halperin, “Bureaucratic Politics: A Paradigm and Some Policy Implications,” *World Politics*, Volume 24 (Spring 1972): 42.

defeating behaviour that actually occurs.”<sup>293</sup> While Iraq cannot be seen as a typical case of a bureaucratic government making well-informed decisions in the best interest of the state, many aspects of Allison’s model still ring true.

## CONCLUSION

The purpose of this case study was to provide some understanding and insight into the decisions Iraq took in trying to acquire NBC weapons. Iraq under Saddam Hussein was essentially a Middle Eastern autocracy turned military dictatorship. The regime did not operate in the same way that a stable western democracy would; Saddam ruled Iraq with an iron fist. Most Iraqi organs of government were largely non-functioning in any sort of decision-making or policy formation role. Saddam ruled with the advice of a few key advisors, some of whom wielded considerable influence with the Iraqi President. There were issues for debate between Saddam’s advisors, but instead of debating key points that could help him formulate rational policy, most of the time discussions revolved around what they thought Saddam was most interested in hearing. Fear of consequence was not the sole motivating factor here. Each individual was guided by his or her own personal set of beliefs. Since Saddam was acutely interested in non-conventional weapons technology, any proposal put forward, either directly or through an intermediary (head of a programme) would be heard.

As previously stated, Saddam’s interest in science came from his association with the IAEC beginning in 1973. From the time he became President in 1979, he was interested in any research proposal that could benefit Iraq’s growing military-industrial complex. ISG states that, “There are multiple references to Saddam ordering MIC to pursue military technology ‘pet projects’ he had received from other government agencies, individual scientists or academics.”<sup>294</sup> Saddam’s personalized and intricate administrative methods meant that control of nuclear, biological and chemical weapons development and deployment was never far from his touch.<sup>295</sup> Nuclear, biological and chemical weapons, radiological dispersal devices, ballistic missiles, superguns and rail guns were all considered high-value commodities by the regime. Significant investments in resources and manpower were provided to scientific and technical

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<sup>293</sup> Edward Rhodes, “Do Bureaucratic Politics Matter?” Some Disconfirming Findings from the Case of the US Navy,” *World Politics*, Volume 47, Number 1 (October 1994): 32.

<sup>294</sup> ISG Report, I, Regime Strategic Intent, 24.

<sup>295</sup> *Ibid.*, 23.

centres in the hope of developing a useable weapons programme. Both internal and external influences proved to be significant motivating factors in the regime's decisions to acquire NBC weapons.<sup>296</sup>

Saddam perceived the threats from Iran and Israel to be very real and of primary concern to the security of Iraq. The specter of Israeli nuclear weapons and a large Iranian army convinced Saddam that he needed to possess 'equatable' weapons. The regime's unwavering belief that the use of chemical weapons against attacking Iranian troops saved the regime from occupation was strong. Whether or not it was actually the case, senior regime officials were convinced of the utility of chemical weapons and that they could play a part in Iraq's overall strategic planning.

As well as the need for a strong external defence, he believed that there were significant internal threats to his leadership.<sup>297</sup> Iraq is a conglomeration of Shia, Sunni and Kurdish peoples – all with differing agendas. Modern Iraq is still very much a tribal society. Most of Saddam's inner circle was just like him, Sunni, Ba'thist and from the area around Tikrit.<sup>298</sup> Traditional tribal relationships were just as important as any modern structures, perhaps even more important to him.<sup>299</sup> This small element of Iraqi society had privilege and entitlement beyond the reach of the majority of Iraq's citizens. It is of little surprise that the other groups within Iraq saw this consolidation of power by Saddam's Tikriti associates as problematic from their perspective. These internal security concerns were of extreme importance to Saddam. Some believe that he saw internal threats greater than any external threat, throughout his entire presidency right up to Operation *Iraqi Freedom*.<sup>300</sup>

Chemical weapons played a large part in the subjugation of the Kurdish populations in northern Iraq. Thousands of Kurdish men, women and children were killed during the Anfal Campaign. These were fear and terror weapons. The regime had been convinced that these weapons were of high-value and could provide the tactical advantage they felt they needed. Joost Hiltermann believes that, "the Iraqi regime could not have systemically murdered this many Kurds if it had not been in a position to first flush them out of their villages – a feat it had signally failed to accomplish in the army's perennial attempts to subdue the countryside, due to the difficult terrain and strong

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<sup>296</sup> Interview with John Walker, 24 April 2008.

<sup>297</sup> This was demonstrated in the Anfal Campaign against Kurdish people in northern Iraq. See. Hiltermann, *A Poisonous Affair*.

<sup>298</sup> Interview with Charles Duelfer, 10 April 2008.

<sup>299</sup> Interview with W. Seth Carus, 3 April 2008.

<sup>300</sup> Interview with Rod Barton, 24 April 2008.

*peshmerga* resistance.”<sup>301</sup> Any potential threat to Saddam’s rule was dealt with swiftly and frequently in the most brutal fashion.

The bureaucratic politics model of decision-making helps to provide a unique view of decision-making inside the regime. Bureaucratic politics scholars point to a clearly defined set of principles that helps make up the decision-making model. In Iraq’s case, clearly defined principles were in short supply. Saddam chose to direct policy via his own fiat instead of allowing Iraq’s governmental and bureaucratic organizations to function in their traditional roles. This led to a very particular and idiosyncratic methodology of decision-making in military and political matters. Relying on a few key individuals kept the circle very small and relegated some of Iraq’s more capable scientists and bureaucrats to the sidelines. Within this insular environment, decisions relating to Iraq’s nuclear, biological and chemical weapons programmes were made.

Early in his tenure as president, Saddam exercised a great deal of control over all weapons-related issues. This changed after *Desert Storm* when he became more withdrawn and less involved in making daily weapons-related decisions, preferring to delegate authority to a few key advisors. The end product was still the same, as no one within Saddam’s inner coterie would have risked not implementing his ideas for fear of retribution. As a result, decisions that were made without the proper input from knowledgeable and capable scientists and bureaucrats ended up being flawed and ultimately problematic for the regime.

Since the refinement of the bureaucratic politics model there has been a distinct lack of empirical studies that have attempted to test this model and many of them have focused on individual crises as opposed to routine policy decisions. Deciding to develop a nuclear, biological or chemical weapons programme is hardly routine, but these decisions were not taken during any sort of crisis either. This particular model is useful for helping to understand a state such as Iraq, where a formalized methodology of decision-making was completely lacking in the weapons-development field.

Perfectly rational explanations for why the regime did what it did do not exist. This is where the bureaucratic politics model can be of some utility. Saddam’s personal leadership style stifled creativity and prevented people from providing him with facts-based advice, for fear of incurring his displeasure. These are things that contributed to the regime’s ultimate failure to clandestinely develop their NBC weapons programmes

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<sup>301</sup> Hiltermann, *A Poisonous Affair*, 135.

to a more complete capacity.

## CHAPTER 5

### CONNECTIONS

Let us not become so preoccupied with weapons that we lose sight of the fact that war itself is the real villain and the scourge of mankind.<sup>1</sup>

- Harry S. Truman

The purpose of this chapter is to identify connections between nuclear weapons on the one hand and chemical and biological weapons on the other by synthesizing and expanding upon the findings from the United Kingdom and Iraq case studies. Each case study provides a unique example of a state seeking to acquire a non-conventional weapons capability. For some, nuclear weapons are seen to be the height of weapons technology and engineering and the retention of other non-conventional weapons capabilities is immaterial. The belief here is that if it is a strategic deterrent that is what is desirable then nothing is more effective than a modern nuclear arsenal. However, different states have differing criteria for wanting to possess non-conventional weapons. Issues as wide-ranging as national/international prestige, addressing national defence or regional security matters, strategic concerns, economic aspects, military utility and the maintenance of important international relationships or agreements are all factors in determining why some states decide to pursue nuclear, biological and chemical weapons.<sup>2</sup>

In order to draw out the connections the chapter is organized into four separate sections, to act as filters. This was done to elicit a broader range of connections from the case studies and in so doing additional historical data gathered during my research has also been included to elaborate upon these points. It should be noted that the boundaries between the categories are not always clearly delineated and therefore some of the connections could fit into more than one of the four sections. The first section is on strategic issues and strategic cultures. States' thoughts and opinions on NBC armament are influenced by its independent strategic culture. The importance placed on possessing NBC weapons varies from state to state, and was a significant factor in both the UK and Iraq case studies. The next section is on political considerations. Decisions taken to

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<sup>1</sup> Harry S. Truman, *Mr. Citizen* (New York: Bernard Geiss Associates, 1960), 267.

<sup>2</sup> Joseph Cirincione highlights five key reasons as to why states want to acquire nuclear weapons. These are security, prestige, domestic politics, technology and economics. Joseph Cirincione, *Bomb Scare: The History and Future of Nuclear Weapons* (New York: Columbia University Press, 2007), 47.



develop nuclear, biological and chemical weapons in both the UK and Iraq were made for several reasons. Defence and security, national prestige and external political factors all come into play here. Following this section is an analysis of economic factors. The allocation of men, money and materiel between and within the weapons programmes had a discernable effect in the UK in particular. Due to Iraq's considerable oil and gas revenues, money was less of a concern, though there was a shortage of skilled scientific and technical personnel. The final section deals with what I have termed future challenges. This section looks at the connections between nuclear weapons and CBW from a research and development angle. Potential problems over the development of new types of weaponry are addressed here. The chapter concludes with a summary of the findings.

From the early days of the Second World War British interest in the military application of nuclear energy was significant. Prime Minister Winston Churchill saw it as a potential war-winning weapon that needed to be broadly researched and developed so that a better understanding of its application could be known. The establishment of Tube Alloys during the autumn of 1941 set in motion a multi-year process of research into atomic energy that eventually culminated with the first British nuclear detonation in late 1952.

Chemical and biological weapons occupied a somewhat different place within British military thinking. The large-scale application of gas during the First World War influenced policy-makers within the UK during this period. It had become important for Britain to possess a wartime chemical weapons capability for tactical reasons as well as providing their own troops with a sense of retribution. As Albert Palazzo explains, in the wake of the first gas attack during the Battle of Second Ypres in April 1915, "the support of the troops demanded a response; left unattended, British morale would inevitably decline if the Germans exploited their chemical advantage."<sup>3</sup> Donald Richter writes, "To the British especially, poison gas seemed less chivalrous, less sporting, less gentlemanly than any other weapon in history and adjectives like 'dastardly' and 'heinous' found new currency."<sup>4</sup> Though, as Richter point out, it did not take the Allies long to retaliate in kind.<sup>5</sup>

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<sup>3</sup> Albert Palazzo, *Seeking Victory on the Western Front: The British Army & Chemical Warfare in World War I* (Lincoln: University of Nebraska Press, 2000), 44.

<sup>4</sup> Donald Richter, *Chemical Soldiers: British Gas Warfare in World War I* (Lawrence: University of Kansas Press, 1992), 1.

<sup>5</sup> Ibid.

Early British thinking on biological weapons, according to Brian Balmer, “shifted along with the dominant conceptions of the threat in the scientific and policy area.”<sup>6</sup> The fear of a German – and later Soviet – attack was indeed a motivating factor and helped to convince the British that they should possess a biological weapons capability. Firstly though, the scientific community needed to further their understanding of how biological agents, manufactured on a large-scale, could be manipulated into affecting life processes. The learning curve was steep and much work had to be done before the UK could develop biological weapons.

The situation in Iraq during the 1980s was similar to the British experience some forty years earlier. The sway that nuclear weapons held over Saddam was considerable.<sup>7</sup> He was fascinated by science, especially nuclear science and it was very important for him that Iraq developed a nuclear capability. First, Saddam believed nuclear weapons would have provided Iraq with an effective deterrent, which would have altered the nature of its relationships in the Middle East, especially between Israel and Iran – Iraq’s two primary rivals. Second, the thought of being the first country in the Arab world to have a nuclear capability gave him an immense feeling of national prestige and intellectual superiority.<sup>8</sup> Saddam saw the potential for Iraq to occupy a unique position not only in the Arab World, but internationally as well.<sup>9</sup> While Iraq was unable to develop a nuclear weapon, it was more successful in acquiring a ballistic missile as well as a CBW capability.

## STRATEGIC ISSUES & STRATEGIC CULTURES

*Security* is often given as the rationale as to why states want to acquire nuclear, biological and chemical weapons. This is reflected in the realist assumption that states are primarily concerned with their survival. As Kenneth Waltz explains, “Only if survival is assured can states safely seek such other goals as tranquility, profit, and power.”<sup>10</sup> Nuclear weapons in particular have long been regarded as being an essential component in the defence of the United Kingdom. Britain’s reasons for wanting an independent nuclear weapons programme were more complicated than one might

<sup>6</sup> Brian Balmer, *Britain and Biological Warfare: Expert Advice and Science Policy, 1930-65* (Basingstoke: Palgrave, 2001), 9.

<sup>7</sup> Saddam served as President of the IAEC from 1973 to 1979, as is discussed in Chapter Four.

<sup>8</sup> Interview with Charles Duelfer, 10 April 2008. See also, Al J. Venter, *Allah’s Bomb: The Islamic Quest for Nuclear Weapons* (Guildford: Lyons Press, 2007).

<sup>9</sup> Interview with a Senior UNSCOM Official, 31 March 2008.

<sup>10</sup> Kenneth N. Waltz, *Theory of International Politics* (Reading: Addison-Wesley, 1979), 126.

expect. The strategic partnership that the UK shared with the US during the Second World War in political and military matters was very important to the British, however the relationship suffered after the war. The Attlee and Churchill governments believed that it was in Britain's best interest to reestablish its strategic partnership and that the creation of a made-in-Britain, deliverable nuclear weapon would assist greatly.

Prior to the *Hurricane* test in 1952, considerable effort was put into investigating the role chemical and biological weapons could play. Having a chemical and biological weapons capability could have provided the UK with a tactical and strategic deterrent option. As mentioned earlier, the Soviet Union had supplanted Nazi Germany as the predominant security threat to the democratized states of the West. At the time the Soviets were suspected of increasing involvement in chemical and biological warfare research and development (R&D) and it was important that the UK be able to deter or respond to these threats.<sup>11</sup> What emerged out of this period was the conviction that Britain must possess a similar retaliatory capability. Carter and Pearson state that, "the need for the capability to retaliate-in-kind with chemical weapons remained, and undoubtedly any such retaliation in future needed to be with nerve agents."<sup>12</sup> Retaliation-in-kind would be a considerable force in influencing British postwar interest in chemical and biological weapons.<sup>13</sup>

In Iraq, non-conventional weapons occupied a central place in Iraqi strategic planning. Nuclear weapons in particular received an elevated priority. As mentioned previously, Saddam was President of the IAEC from 1973 to 1979 and was fascinated with nuclear power. For Saddam, nuclear weapons provided more than an effective deterrent; they represented an ideal, the greatness and legitimacy of Iraq as a regional and global power. Saddam saw, in Iraq, the capability of being the dominant player in the Middle East – a bulwark against the "Persians" and a military rival to Israel.<sup>14</sup> For Saddam nuclear weapons were primarily about prestige. He believed that Iraq, due much in part to its past glories, should occupy a lofty position within the region.<sup>15</sup>

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<sup>11</sup> Chiefs of Staff Committee, Joint Intelligence Committee, Soviet Interests, Intentions and Capabilities, Report by the Joint Intelligence Committee, 6 August 1947. TNA CAB 158/1.

<sup>12</sup> G. B. Carter and Graham S. Pearson, "Past British Chemical Warfare Capabilities," *The RUSI Journal*, Volume 141, Number 1 (February 1996): 61.

<sup>13</sup> See page 105, note 297.

<sup>14</sup> Interview with Charles Duelfer, 10 April 2008.

<sup>15</sup> This is in reference to the rich history of mathematics and science in Ancient and Medieval Iraq (Mesopotamia). For a more detailed look see, Eleanor Robson, *Mathematics in Ancient Iraq: A Social History* (Princeton: Princeton University Press, 2008).

Nuclear weapons were the way to elevate Iraq to a new position of hegemony within the region.

The thought of conducting operations with chemical and biological weapons did not create a strong feeling of moral opprobrium within the regime, even though Iraq was a state party to the 1925 Geneva Protocol.<sup>16</sup> As stated earlier, many individuals within positions of power, both militarily and politically, believed that chemical weapons had saved Iraq from being overrun by Iran during their eight-year war. Whether or not this was actually the case is immaterial. Saddam and many of his regime officials believed this was the truth. Chemical weapons occupied a special place within the minds of Saddam and his subordinates. Chemical weapons offered a tactical advantage to states wishing to use them, especially if an adversary did not possess a similar weapon or adequate defences against it. Iraq possessed different types of chemical munitions and had committed atrocities and created mass casualties against Iranian troops as well as some Kurdish populations, internally. This begs the question of why did Iraq choose to not use chemical weapons against Coalition forces during Operation *Desert Storm* in 1991? This will be addressed in the upcoming section on deterrence.

### *Hedging One's Bets*

From a strategic standpoint, biological weapons can offer a different set of advantages than chemical weapons. For Saddam biological weapons were an instrument of terror. Iraqi research into biological agents showed some interesting developments. ISG reported significant R&D into aflatoxin (Agent C) that began in 1988, based on previous non-military work of Dr. 'Imad Dhiyab.<sup>17</sup> Initial weapons tests were conducted in November 1989 using 122mm rockets.<sup>18</sup> The choice of aflatoxin as a biological weapon is a strange one. As the Centers for Disease Control and Prevention show, exposure to aflatoxin is known to cause both chronic and acute hepatocellular injury. Statistics show that from an outbreak in Kenya, acute aflatoxin poisoning results in liver failure and death in up to 40% of cases.<sup>19</sup> Richard Spertzel questions the utility of

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<sup>16</sup> Iraq deposited the instrument of ratification on 8 September 1931. "Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare, 17 June 1925." Federation of American Scientists, accessed 13 May 2010, <http://www.fas.org/nuke/control/geneva/text/geneva1.htm>.

<sup>17</sup> ISG Report, III, Biological Programme, 22.

<sup>18</sup> Ibid.

<sup>19</sup> "Environmental Hazards & Health Effects – Health Studies, Aflatoxin." Centers for Disease Control and Prevention, accessed 24 April 2010, <http://www.cdc.gov/nceh/hsb/aflatoxin/>.

having an agent that presents symptoms years after exposure.<sup>20</sup> It is hard to see the interest the regime had in funding aflatoxin research, as it does not seem to be a logical choice for a weaponizable agent. It could however, be introduced into a population only to have people dying years later from liver failure. This is a long-term method to inflict fatalities upon a specific population; it is not an effective short-term biological weapon.<sup>21</sup> Brian Jones believes that:

Aflatoxin has been dismissed by most as an ineffective agent, having only low acute toxicity and a long-term carcinogenic effect. However, the toxin does have strong immunosuppressant properties and as such could be of real interest to an offensive BW programme. Depression of the immune system by aflatoxin occurs within the incubation timescale of several disease causing microorganisms. Thus it could be used to enhance the effect of otherwise innocuous agents or to increase the susceptibility of a population to naturally occurring disease. For deployed troops that could be very important. The modulation of the immune system in general and an interest in aflatoxin and other mycotoxins could be relevant to more advanced concepts of use and agent development.<sup>22</sup>

Former UNSCOM Commissioner A. J. J. Ooms believed that the regime had developed aflatoxin for precisely this reason. As Ooms explained, “Aflatoxin causes fatal liver cancer after a period of five or six years. Because of this delay, it has no military significance whatsoever. Therefore, the only possible conclusion is that the Iraqis have developed aflatoxin as a weapon of genocide against the Kurds.”<sup>23</sup> The way in which Saddam viewed internal threats to the regime it must be said that it is difficult to rule out whether or not this was part of the regime’s plan to deal with the Kurdish question.<sup>24</sup>

Possessing a deliverable biological weapon would have given Saddam considerable leverage within Iraq as well as the region in general. More specifically, Israel is an unofficially recognized nuclear weapon possessor state and its dealings with a BW capable Iraq would have been very different. This is the key point here. Saddam knew the destabilizing effect that BW would have on the region. He was quoted as saying, “We are aware if such a method (BW) were used, the situation would become

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<sup>20</sup> Interview with Richard Spertzel, 5 April 2008.

<sup>21</sup> Interview with Jonathan Tucker, 4 April 2008.

<sup>22</sup> Brian Jones, “Nuclear Blindness and the Silent Rise of BW,” Paper presented at The University Sussex, Sussex Days, 13 March 2006, 14.

<sup>23</sup> “Irak Produceert Biologische Wapens in Sudan,” *De Volkskrant*, 6 May 1997, 1. “Iraq: UN Inspector Fears Iraq Plans Germ Warfare against Kurds,” as translated from the Dutch in FBIS-TAC-97-127, 7 May 1997.

<sup>24</sup> Interview with Richard Spertzel, 5 April 2008.

uncontrollable.”<sup>25</sup> However, that did not stop the regime from continuing to support its clandestine BW programme. During the same telecast Saddam claimed that:

As to whether scientists have done research on this or that sort of germ, I do not give a guarantee in this matter, and I do not deny it... I mean conventional scientific research, not germ warfare. I mean using germs for scientific purposes. I am aware that conducting research on germs for military purposes amounts to using them as a weapon.<sup>26</sup>

It is difficult to know whether Saddam actually believed in what he was quoted as saying. Rhetoric aside, what is clear is the fact that the regime had decided to invest in research into biological weapons with the express desire of acquiring a biological weapons capability. Saddam saw chemical and biological weapons as being able to provide security against a nuclear-armed Israel and a much larger conventional military power in Iran.

Another connection that came out of the Iraq case study centres on an oft-repeated axiom made by then-President of Iran Hojjat o-Eslam Akbar Hashemi-Rafsanjani in reference to Iraq’s use of chemical weapons during the Iran-Iraq War. Rafsanjani claimed that in response to Iraq’s use of chemical weapons against his country:

Chemical and biological weapons are a poor man’s atomic bombs and can be easily produced. We should at least consider them for our defence... Although the use of such weapons is inhumane, the (Iran-Iraq) war taught us that international laws are only drops of ink on paper.<sup>27</sup>

The concept of the “poor man’s atomic bomb” has resonated throughout parts of the Middle East. In a speech to the Arab Socialist Union National Congress in Cairo on 17 February 1972, President of Egypt Anwar Sadat suggested that, “The only reply to biological warfare is that we too should use biological warfare.”<sup>28</sup> The presence of a nuclear-armed Israel has been destabilizing in the region for decades. Seth Carus states

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<sup>25</sup> Full text of remarks during a meeting in Mosul on 12 April 1990 between President Saddam Hussein, Foreign Minister Tariq Aziz, the US ambassador to Iraq and US Senators Robert Dole, Howard Metzenbaum, Frank Murkowski, James McClure and Alan Simpson, broadcast as read by an announcer on Baghdad domestic service, 14:00 hours GMT, 16 April 1990, as translated from the Arabic in FBIS-NES-90-074, 17 April 1009, 5-13.

<sup>26</sup> Ibid.

<sup>27</sup> Islamic Republic News Agency, Tehran (English), 19 October 1988 as reported in FBIS, *Daily Report: Near East and South Asia*, 19 October 1988, 55-56.

<sup>28</sup> Stockholm International Peace Research Institute, *The Problem of Chemical and Biological Warfare, Vol. II* (New York: Humanities Press, 1971), 241.

that, “From this perspective, biological warfare is not a desired instrument of war fighting; but it is, however, essential to prevent its use by an enemy.”<sup>29</sup>

In November 1996 the Syrian Ambassador to Cairo, Issa Darwish, was reported as saying that Syria would retaliate with CW if Israel attacked it with nuclear weapons.<sup>30</sup> The Ambassador issued a denial the following day, stating that they (Syria) “do not possess weapons of mass destruction and do not threaten anyone with them.”<sup>31</sup> Though Syria has never officially admitted that it possesses CW comments like this lead one to believe that chemical weapons are seen as a necessary and legitimate deterrent to Israeli nuclear weapons. As long as these types of weapons are seen as an effective counter to either a nuclear-armed opponent or one with overwhelming conventional forces, there will be considerable interest in them. Colin Gray believes that, “The quintessential tool of the strategically disadvantaged who desperately requires an asymmetrical edge, lies in the basket of WMD options.”<sup>32</sup> A state that possesses a non-conventional weapons capability in a region rife with security issues – according to western perceptions – presents a destabilizing force. But from the perspective of the proliferator, it is about prestige, national defence and a deterrent capability against a potentially superior adversary. Looking at the strategic culture of a particular state can help shed some light on the question of why states want to acquire these types of weapons.

### *Deterrence: Threats and Responses*

Another issue that emerged from my research is how states’ concepts of deterrence have developed and changed over time. Thomas Schelling argues that, “thinking about deterrence has evolved over the decades in the hopes of meeting and deterring different types of threats.”<sup>33</sup> This is noticeable when looking at the United States during the early years of the Cold War. In a speech before the Council of Foreign

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<sup>29</sup> W. Seth Carus, *The Poor Man’s Atomic Bomb? Biological Weapons in the Middle East* (Washington: The Washington Institute for Near East Policy, 1991), 35.

<sup>30</sup> M. Zuhair Diab, “Syria’s Chemical and Biological Weapons: Assessing Capabilities and Motivations,” *The Nonproliferation Review* (Fall 1997): 105.

<sup>31</sup> “Syria: A Chemical Response Against Israel’s Nuclear Threat” (in Arabic), *Al-Arab International* (London) 28 November 1996, 2; Abdul Ra’ouf Daoud, “Israel Sees Small Probability of War with Syria” (in Arabic), *Al-Hayat* (London), 29 November 1996, 5, cited in Diab, “Syria’s Chemical and Biological Weapons,” 105.

<sup>32</sup> Colin Gray, *Another Bloody Century: Future Warfare* (London: Phoenix, 2005), 277.

<sup>33</sup> Thomas C. Schelling, *The Strategy of Conflict* (Cambridge: Harvard University Press, 1960), 6.

Relations, US Secretary of State John Foster Dulles outlined the priorities of President Eisenhower's New Look national security policy. In his speech Dulles said that:

Local defences must be reinforced by the further deterrent of massive retaliatory power. A potential aggressor must know that he cannot always prescribe battle conditions that suit him. Otherwise, for example, a potential aggressor, who is glutted with manpower, might be tempted to attack in confidence that resistance would be confined to manpower. He might be tempted to attack in places where his superiority was decisive.<sup>34</sup>

This was a departure from the Truman administration's policy of containment, which Eisenhower and Dulles believed was not an effective policy in the face of Soviet aggression in Eastern Europe.<sup>35</sup> The cornerstone of New Look was the United States National Security Council document NSC 162/2 of 30 October 1953 where it was held that the US would need to have "a strong military posture, with emphasis on the capability of inflicting massive retaliatory damage by offensive striking power."<sup>36</sup> This was significant as it was widely taken to mean that the US would reserve the right to respond to any sort of attack with all options available, including nuclear weapons, regardless of the nature of the Soviet incursion. This was a blanket declaration stating that if the Soviets attacked any NATO interest with conventional, chemical or nuclear weapons, the response will be swift and most likely nuclear. This line of thinking would become obsolete. Marc Trachtenberg believes that as the decade wore on, the strategy of massive retaliation was viewed increasingly as bankrupt – even at the highest levels of the (Eisenhower) administration.<sup>37</sup>

As early as 1954, some strategic thinkers had begun to question the efficacy of the doctrine of massive retaliation in regard to localized or peripheral conflicts.<sup>38</sup> As Klaus Knorr explains:

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<sup>34</sup> John Foster Dulles, "The Evolution of Foreign Policy," *Department of State, Press Release No. 81*, Before the Council of Foreign Relations, New York, 12 January 1954.

<sup>35</sup> In the July 1947 issue of *Foreign Affairs*, George F. Kennan, writing under the pseudonym "X" claimed that the Soviet Union was inherently expansionist and needed to be checked at every opportunity. He writes, "This would of itself warrant the United States entering with reasonable confidence upon a policy of firm containment, designed to confront the Russians with unalterable counter-force at every point where they show signs of encroaching upon the interests of a peaceful and stable world." George F. Kennan, "The Sources of Soviet Conduct," *Foreign Affairs*, Volume 25 (July 1947): 581.

<sup>36</sup> "A Report to the National Security Council by the Executive Secretary on Basic National Security Policy, document NSC 162/2 of 30 October 1953." Federation of American Scientists, accessed 13 May 2010, [www.fas.org/irp/offdocs/nsc-hst/nsc-162-2.pdf](http://www.fas.org/irp/offdocs/nsc-hst/nsc-162-2.pdf).

<sup>37</sup> Marc Trachtenberg, *History and Strategy* (Princeton: Princeton University Press, 1991), 40.

<sup>38</sup> Bernard Brodie claims that Basil Liddell Hart began writing on the subject of limited war as early as 1946. Bernard Brodie, "Review of Atomic Weapons and East-West Relations," *Bulletin of the Atomic Scientists* Volume 13, Number 3 (March 1957): 107; Bernard Brodie, "Unlimited Weapons and Limited War," *The Reporter*, Volume 11, (18 November 1954): 16-21; W. W. Kaufmann, "The Requirements of



If the threat of massive reprisal failed to deter relatively minor and ambiguous aggression, and had to be made good, the enormity of our response would be out of all proportion to the challenge. The gross disproportionality between means and ends would prove inhibiting for moral and political reasons, and the threat of massive retaliation would suffer in credibility.<sup>39</sup>

As a result, the concept of limited war was given a new impetus. Robert Osgood defines limited war as, “one in which the belligerents restrict the purposes for which they fight to concrete, well-defined objectives that do not demand the utmost military effort of which the belligerents are capable and that can be accommodated in a negotiated settlement.”<sup>40</sup> Henry Kissinger argued that a limited war, “reflects an attempt to affect the opponent’s will, not to crush it, to make the conditions to be imposed seem more attractive than continued resistance, to strive for specific goals and not for complete annihilation.”<sup>41</sup> Clausewitz believed that wars with limited aims could be undertaken if the military defeat of an enemy is not possible or if in fact it is not the stated purpose of the conflict.<sup>42</sup> He states that, “the nature of the political aim, the scale of demands put forward by either side, and the total political situation of one’s own side, are all factors that in practice must decisively influence the conduct of war.”<sup>43</sup> Limited war supplanted massive retaliation as the pre-eminent strategic doctrine for the US and its allies.<sup>44</sup>

Examples of limited wars in the postwar period were not uncommon. Hostilities broke out in the former colony of British Malaya in 1948. During the first week of June, three European rubber plantation managers were killed at Sungai Siput, Perak by troops

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Deterrence,” in *Military Policy and National Security*, ed. W. W. Kaufmann. (Princeton: Princeton University Press, 1956), 12-38.

<sup>39</sup> Klaus Knorr, “Limited Strategic War,” in *Limited Strategic War*, ed. Klaus Knorr and Thornton Read. (London: The Pall Mall Press, 1962), 6.

<sup>40</sup> Robert Endicott Osgood, *Limited War: The Challenge to American Security* (Chicago: University of Chicago Press, 1957), 1-2.

<sup>41</sup> Henry Kissinger, *Nuclear Weapons and Foreign Policy* (New York: Harper & Brothers, 1957), 140.

<sup>42</sup> Clausewitz points to three acts that he considers most important for the defeat of an enemy, “which are: 1) destruction of his army, if it is at all significant; 2) seizure of his capital if it is not only the center of administration but also that of social, professional, and political activity; and 3) delivery of an effective blow against his principal ally if that ally is more powerful than he.” Carl von Clausewitz, *On War*, trans. Michael Howard and Peter Paret (Princeton: Princeton University Press, 1984), 596.

<sup>43</sup> *Ibid.*, 602.

<sup>44</sup> Writing in the January 1956 issue of *World Politics*, Anthony W. Buzzard states that, “Graduated deterrence, by providing an intermediate deterrent, guards against these dangers, and gives more latitude for our diplomacy, without reducing our deterrent against all-out attack. This option of intermediate action, together with the removal of the element of bluff, would not only improve our capacity to deter; it would also enhance our ability to negotiate from local tactical strength, and ability which becomes increasingly important as the strategic hydrogen stalemate approaches.” Anthony W. Buzzard, “Massive Retaliation and Graduated Deterrence,” *World Politics*, Volume 8, Number 2 (January 1956): 230.

of the Malayan Races Liberation Army (MRLA).<sup>45</sup> Through waging a guerrilla campaign, the MRLA insurgents, never numbering more than 6000 at any one time, had effectively tied up approximately 300 000 Security Forces personnel, including regular troops, police and home guard.<sup>46</sup> In 1953, discussions between the War Office, Air Ministry and Ministry of Supply had agreed to conduct airborne trials – Codenamed Operation *Crusoe* – by using non-lethal chemical agents to determine whether:

BBC gas dispersed from improvised break-up bombs can present an effective barrier to the passage of determined opponents in Malayan terrain, and to determine the required spacing of the bombs to produce the effect.<sup>47</sup>

The conclusions of the operation were that BBC would not stop a determined man who was aware of the physiological characteristics of the agent and the degree of the contamination.<sup>48</sup>

During the 1950-53 Korean War the US, through the United Nations, faced multiple Chinese and North Korean accusations of deploying chemical and biological warfare agents in the theatre.<sup>49</sup> These ranged from allegations of three US B-29 bombers dropping gas bombs over an area of Nampo City, causing 1379 casualties,<sup>50</sup> to the introduction of insects infected with plague, cholera and other infectious diseases.<sup>51</sup> These allegations proved to be false and attempted to discredit the US-led war effort while also promoting, as William Stueck explains, “the ongoing hate-America campaign at home amid an increasingly weary population.”<sup>52</sup> Though fraudulent, allegations like

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<sup>45</sup> Barbara Watson Andaya and Leonard Y. Andaya, *A History of Malaysia* (Basingstoke: Palgrave, 2001), 271.

<sup>46</sup> Robert Jackson, *The Malayan Emergency: The Commonwealth's Wars, 1948-1966* (London: Routledge, 1991), 115.

<sup>47</sup> Bromobenzylcyanide, (BBC) also known as CA gas, is a persistent lachrymator or tear gas from the early twentieth century. A. M. Kinnear, “The Determination of Phenylbromoacetonitrile,” *Journal of the Society of Chemical Industry*, Volume 67, Number 1 (January 1948): 35-38; BBC Gas Trials, Top Secret, 6 March 1953. TNA AIR 23/8593.

<sup>48</sup> Operational Research Unit Far East, Memorandum NoQ5/53, Operation Crusoe, 10 June 1953. TNA AIR 23/8593.

<sup>49</sup> “Peiping Says US Uses Gas,” *New York Times*, 5 March 1951, 3; “Germ Warfare in Korea?” *Science News Letter*, 8 July 1950, 22; “Germ Warfare: North Koreans’ Latest Allegation,” *Manchester Guardian*, 25 February 1952, 5; “Reds Renew Germ Warfare Charge,” *The Chicago Defender*, 15 March 1952, 13; “Charges of Germ Warfare, Communist Propaganda in Korea,” *The Times*, 28 February 1952, 3; “More Allegations of Germ Warfare,” *The Times*, Tuesday 3 March 1953, 3; Report of the International Scientific Commission for the Investigation of the Facts Concerning Bacterial Warfare in Korea and China, Beijing, 1952; Wilfred G. Burchett, *This Monstrous War* (Melbourne: Joseph Waters, 1953).

<sup>50</sup> Stockholm International Peace Research Institute, *The Problem of Chemical and Biological Warfare, Volume I: The Rise of CB Weapons* (Stockholm: Almqvist & Wiksell, 1971), 158.

<sup>51</sup> John Ellis van Courtland Moon, “Biological Warfare Allegations: The Korean War Case,” *Annals of the New York Academy of Sciences*, Volume 666 (31 December 1992): 54-56.

<sup>52</sup> William Stueck, *The Korean War: An International History* (Princeton: Princeton University Press, 1995), 275.

these are, according to Milton Leitenberg, “extremely detrimental to efforts to maintain the international norms against use of such weapons, and hence, it is anything but a trivial propaganda issue.”<sup>53</sup>

As a result of these postwar limited war engagements a new US-based strategic doctrine arose. The doctrine of flexible response first came into prominence during the administration of US President John Kennedy.<sup>54</sup> This proposed that there was a need to have a credible deterrent in order to match non-nuclear escalation. This essentially gave the President multiple options during a time of crisis, which was seen to be a more favourable course of action. Martin van Creveld states that, “the purpose of flexible response was to safeguard the continued existence of conventional forces, which led to massive investments in newer types of military technology.”<sup>55</sup> The Cuban Missile Crisis of October 1962 saw the escalation of hostilities between the US and USSR over the placement of nuclear missiles on the island of Cuba. The Kennedy administration had examined every possible option in order to facilitate a peaceful resolution to the situation, though some members of his inner circle were convinced that the nuclear option was the most comprehensive response.<sup>56</sup> The key is that by possessing a greater range of options, the overall credibility of the United States’ deterrence posture would be enhanced, while minimizing the potential for a nuclear weapons strike. During the crisis, biological weapons are said to have had an elevated operational role within US military planning.<sup>57</sup> US medium bombers were deployed to the region, equipped with payloads of Venezuelan equine encephalitis (VEE), an infectious alphavirus that causes encephalitis in horses and humans.<sup>58</sup> VEE was one of seven antipersonnel BW agents

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<sup>53</sup> Milton Leitenberg, “The Korean War Biological Weapon Allegations: Additional Information and Disclosures,” *Asian Perspective*, Volume 24, Number 3 (2000): 171.

<sup>54</sup> John C. Garnett, “British Strategic Thought,” in *British Defence Policy in a Changing World*, ed. John Baylis. (London: Croom Helm, 1977), 161.

<sup>55</sup> Martin van Creveld, *The Transformation of War* (New York: Free Press, 1991), 13.

<sup>56</sup> An authoritative account of the events of the October Crisis is: Graham T. Allison and Philip Zelikow, *Essence of Decision: Explaining the Cuban Missile Crisis* (New York: Longman, 1999).

<sup>57</sup> Richard D. McCarthy, *The Ultimate Folly: War by Pestilence, Asphyxiation, and Defoliation* (London: Victor Gollancz, 1970), 62.

<sup>58</sup> According to the Centers for Disease Control and Prevention, “The majority of human infections are asymptomatic or may result in a nonspecific flu-like syndrome. Onset may be insidious or sudden with fever, headache, myalgias, malaise and occasionally prostration. Infection may, however, lead to encephalitis, with a fatal outcome or permanent neurologic sequelae. Fortunately, only a small proportion of infected persons progress to frank encephalitis.” “Division of Vector-Borne Infectious Diseases, Information on Arboviral Encephalitides.” Centers for Disease Control and Prevention, accessed 22 May 2010, <http://www.cdc.gov/ncidod/dvbid/arbor/arbdet.htm>.

produced and stockpiled by the US.<sup>59</sup> The biological agents were not used during the crisis, though as Miller, Engleman and Broad state this showed an, “emerging ability to conduct a new kind of warfare, that had potential repercussions far beyond Cuba.”<sup>60</sup>

### *The 1963 Decision and Flexible Response*

The British government’s decision to discontinue offensive R&D of chemical weapons was taken in July 1956 and was made for a number of reasons, part political, part economic and part pragmatic.<sup>61</sup> Four years after the decision was taken, questions concerning the efficacy of chemical weapons had begun to surface.<sup>62</sup> As a result, two independent committees were appointed to study the potential utility of chemical and biological warfare. The first committee was an operational assessment conducted by the Chiefs of Staff.<sup>63</sup> The Chief Scientific Adviser to the Ministry of Defence Sir Solly Zuckerman set up the second committee, chaired by Sir Alexander Todd.<sup>64</sup> Known as the Todd Panel, this small group was, “to consider the potentialities in warfare of biological and chemical agents, and to make recommendations about the scope of the programme devoted to their study in the UK.”<sup>65</sup> Both the Todd Panel and Tri-service Operational Assessment reports, delivered to the Chiefs of Staff, were considered to be “too complex” and yet another subcommittee of the DRPC was formed, charged with

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<sup>59</sup> The others were *Brucella suis*, *Pasteurella tularensis*, Q fever rickettsia, *B. anthracis*, botulinum toxin and staphylococcal enterotoxin. US Department of the Army, “US Army Activities in the US Biological Warfare (BW) Program,” (Washington: Office of the Secretary of the Army, 8 March 1977), 8.

<sup>60</sup> Judith Miller, Stephen Engelberg and William Broad, *Biological Weapons and America’s Secret War* (New York: Simon & Schuster, 2001), 57.

<sup>61</sup> Research and development into CBW at the time was costing the British government £1.84 million per annum. Ministry of Defence, Defence Research Policy Committee, Chemical and Biological Warfare, Note by the Joint Secretaries, DRP/P(62)33, 10 May 1962. TNA DEFE 10/490.

<sup>62</sup> In an annex to a confidential DRPC note on chemical warfare, The Chief Scientific Adviser to the Ministry of Defence Sir Solly Zuckerman was recorded as saying that the conclusions reached in the last Chiefs of Staff review of chemical and biological warfare, might no longer be valid in view of the great advances which had been made in the past two years, especially in the field of chemical warfare. These advances demonstrated that the toxicity of known lethal agents was now even greater than had been appreciated in 1958, and it had been proved that they could be easily disseminated over wide areas by small numbers of aircraft. Advances were also made in the comparatively new field of incapacitating agents. Chiefs of Staff Committee, Confidential Annex to COS (60) 59<sup>th</sup> Meeting, 27 September 1960. TNA DEFE 13/440.

<sup>63</sup> This was known as the Tri-service Operational Assessment.

<sup>64</sup> The Todd panel consisted of Sir Harry Melville, Dr. F. J. Wilkins, Professor E. R. H. Jones, Professor E. T. C. Spooner, Major-General J. R. C. Hamilton and Professor P. B. Medawar. The War Office, Advisory Council on Scientific Research and Technical Development, Biological Research Advisory Board, Minutes of the 49<sup>th</sup> Meeting of the Board, 5 May 1961. TNA WO 195/15168.

<sup>65</sup> The War Office, Advisory Council on Scientific Research and Technical Development, Biological Research Advisory Board, Minutes of the 49<sup>th</sup> Meeting of the Board, 5 May 1961. TNA WO 195/15168.

preparing a “single, simplified short paper.”<sup>66</sup> The subcommittee concluded that, “due to recent scientific advances, a reappraisal of current UK policy on chemical and biological warfare is warranted.”<sup>67</sup> The report concluded that there was no need for a strategic offensive capability for either chemical or biological weapons, though they did suggest that chemical weapons could prove, in certain circumstances, to be a decisive weapon in a limited war engagement.<sup>68</sup>

Following this, a Chiefs of Staff Joint Planning Committee report from October 1962 stated:

CW could be an effective means of delaying the enemy in a period before nuclear weapons are used. Although tactical nuclear weapons might be more effective in producing delay, there is risk of escalation. We agree that the use of CW might well keep the battle under control and provide a means of delaying the enemy and gaining time for negotiations.<sup>69</sup>

There was an operational need for a reassessment of the current policy – which was last reviewed in 1958 – due to recent advances in military and civil science, specifically chemical weapons as well as changes in the strategic climate.

That November, there was discussion as to the practicalities of chemical warfare in view of British defence planning. A note by Secretary J. K. Watkins of the Chiefs of Staff Committee read:

We would be free to use CW in retaliation and, in view of the access which our potential enemies might have to Soviet technology, we consider that we should equip ourselves with a retaliatory capability with lethal and, when available, incapacitating agents. The research both into a suitable agent and a weapon delivery system would assist training and provide a practical background to the research and development for our defensive capability.<sup>70</sup>

Interest in developing an offensive capability for both lethal *and* incapacitating chemical agents was considerable. In fact, some 240 chemical compounds were tested

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<sup>66</sup> The War Office, Advisory Council on Scientific Research and Technical Development, Biological Research Advisory Board, Minutes of the 51<sup>st</sup> Meeting of the Board, 6 December 1961. TNA WO 195/15287.

<sup>67</sup> Ministry of Defence, Defence Research Policy Committee, Chemical and Biological Warfare, Note by the Joint Secretaries, DRP/P(62)33, 10 May 1962. TNA DEFE 10/490.

<sup>68</sup> Ibid.

<sup>69</sup> Chiefs of Staff Committee. Joint Planning Committee. Chemical and Biological Warfare, JP(62)96(Final), 12 October 1962. TNA, DEFE 11/660.

<sup>70</sup> Chiefs of Staff Committee, Chemical and Biological Warfare, Note by the Secretary, COS(62)432, 6 November 1962. TNA DEFE 11/660.

for use as possible chemical agents between August 1961 and December 1963.<sup>71</sup> The perception that chemical agents could prove to be decisive in a limited war had gained traction. In November 1962 the DPRC concluded that while in limited war chemical weapons might prove decisive, “the employment of a lethal agent is likely to be unacceptable politically,” while “the employment of an incapacitating agent may not be so circumscribed.”<sup>72</sup>

A memorandum by the Minister of Defence, Peter Thorneycroft, from 16 April 1963 laid out MoD’s thoughts on the reacquisition of a limited chemical warfare capability; it read:

I propose therefore to authorise, subject to the normal discussion with the Treasury, the increase in research and development on lethal and incapacitation chemical agents and the means for their dissemination (at a cost of £0.624m spread over 5 years) of a lethal chemical agent, the acceleration of our production of defensive equipment (at a total cost of £17.5m over the next 5 years instead of the next 10 as planned) and a small increase in research on biological agents, (costing £0.37m over 5 years) together with large scale trials (costing £0.1m a year for 3 years). If a successful incapacitating agent is developed we should produce a certain amount of this also.<sup>73</sup>

On 3 May 1963, the Cabinet Defence Committee chaired by Prime Minister Harold MacMillan took the decision to reacquire a limited offensive chemical warfare capability.<sup>74</sup> According to Macmillan, Britain’s priorities would be threefold; “first was to continue research in order to keep up to date with technique and with American information; second, the development of offensive capability as a deterrent against such agents being used against us; third, defensive measures.”<sup>75</sup> This was a significant decision as it provided a specific set of conditions in which chemical weapons could be used. The key point is that Britain would reacquire a limited offensive capability as opposed to restarting a full-scale research, development and production programme.

The decision to reacquire a limited offensive chemical weapons capability was influenced through British experiences in Malaya, Korea and Borneo, as well as the advent of the flexible response concept. The significance of this is that chemical

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<sup>71</sup> R. W. Brimblecombe, Biological Testing of Incapacitating Agents: Part IV, 1964, Further Results of Screening Tests on New Compounds, Porton Technical Paper No.902, 2 October 1964. TNA WO 189/422.

<sup>72</sup> Chiefs of Staff Committee. Joint Planning Committee. Chemical and Biological Warfare, Appendix to the Annex of JP(62)96(Final), 12 October 1962. TNA DEFE 11/660.

<sup>73</sup> Cabinet Defence Committee, Biological and Chemical Warfare Policy, Memorandum by the Minister of Defence, D(63)14, 16 April 1963. TNA CAB 131/28.

<sup>74</sup> Cabinet Defence Committee, Minutes of the 6<sup>th</sup> meeting, 3 May 1963. TNA CAB 131/28.

<sup>75</sup> Ibid.

weapons were seen to be something that could in effect prolong the non-nuclear phase of battle, which is an important component of flexible response.<sup>76</sup> The question of the UK using nuclear weapons against Indonesian forces in the rainforest of North Borneo did not seem logical. Sir Arthur Snelling, raised this point in a memorandum from March 1963, “Do we conceive it possible that our supreme national interests should be at stake in the Far East to such an extent as to necessitate the unilateral usage of nuclear weapons in that area?”<sup>77</sup> The answer to this question was, “no.” As Christopher Tuck states, “the wider political costs associated with an escalation to undeniable operations and limited war made such options a last resort.”<sup>78</sup>

The significance of the 1963 decision to reacquire a limited offensive CW capability is such that it shows how changes in the strategic environment can effect a government’s views on NBC weapons. Escalating the confrontation with Indonesia was too high a political price for Britain as it can be argued that its national interests and security were never at stake and to risk nuclear war over this issue would have been unacceptable. Because of events such as this, for a brief period, chemical warfare had reentered the debate as it was thought that these weapons could provide Britain with a non-nuclear war fighting option.<sup>79</sup> As Carter and Pearson explain, “The 1963 proposal did not result in the reacquisition of either large scale production facilities or chemical weapons for the Armed Forces.”<sup>80</sup> John Walker argues, “Despite the research, no decision was taken at Ministerial level to implement the 1963 decision to reacquire an offensive CW programme in full on either lethal or incapacitating agents.”<sup>81</sup>

As mentioned, one of the key points of flexible response is the extension of the non-nuclear phase of combat. The example of the British in North Borneo showed how chemical weapons could provide a non-nuclear option in a limited war engagement.

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<sup>76</sup> Defence Research Policy Committee, Issues for Decision on Chemical and Biological Warfare, Note by the Joint Secretaries, 24 July 1962. TNA DEFE 10/491.

<sup>77</sup> Memorandum by Sir A. Snelling, “Defence in the Far East about 1970” for the Official Oversea Coordinating Committee, OC(0)(63)7. CAB 134/2277.

<sup>78</sup> Christopher Tuck, “Borneo 1963-66: Counter-insurgency Operations and War Termination,” *Small Wars & Insurgencies*, Volume 15, Number 3 (2004): 103.

<sup>79</sup> Chiefs of Staff Committee, Defence Planning Committee, Chemical and Biological Warfare, Report by the Defence Planning Staff, 3 September 1965. TNA DEFE 6/97.

<sup>80</sup> G. B. Carter and Graham S Pearson, “Past British Chemical Warfare Capabilities,” *The RUSI Journal*, Volume 141, Number 1 (February 1996): 65.

<sup>81</sup> John Walker, “‘Inappropriately Hilarious’: An Historical Overview of the Interest in and Use of ‘Incapacitating Chemical Agents’” (paper presented at the International Committee for the Red Cross expert meeting on Incapacitating Chemical Agents: Implication for International Law, Montreaux, Switzerland, 24-26 March 2010), 16.

This concept formed a fundamental part of NATO's strategic doctrine, primarily through denial operations. According to US Army Field Manual (FM) 5-102:

A denial measure is an action to deny the enemy the use of space, personnel, or facilities. It may include destruction, removal, contamination, or obstacle construction. Denial operations have always been an important facet that, in many cases, determined the outcome of wars. Denial operations over the years have ranged from the siege of forts or castles to the destruction of ball bearing plants.<sup>82</sup>

Terrain denial in particular had formed part of NATO's plans for the defence of Europe for decades. The battlefield application of chemical agents was widely considered, as Soviet forces greatly outnumbered NATO troops in Europe. By using chemical weapons to establish preferential transport corridors for Soviet troops to move through, mobile "kill-zones" would be created to deny the Soviets the ability to move their forces of their own accord.<sup>83</sup> Seeing a utility for chemical weapons, NATO had incorporated them into its strategic doctrine.

Document MC 14/3 stated that NATO should rely principally upon its conventional and nuclear forces for deterrence, but should also possess the capability to employ effectively:<sup>84</sup>

- a. Lethal CW agents in retaliations, on a limited scale
- b. Passive defensive measures against CW
- c. Passive defensive measures against BW

This is another example of how chemical weapons can provide a non-conventional war fighting option and prolong the non-nuclear phase of combat, which, in the event of Soviet aggression would have been necessary as full, conventional mobilization takes time.<sup>85</sup> The doctrine of flexible response was formally adopted by the UK through NATO ministerial acceptance of MC 14/3 on 14 December 1967.<sup>86</sup>

Currently the belief that a military has to be flexible and able to adapt has been a focal point for successive US administrations since Operation *Desert Storm*. Flexible response – or what former Secretary of Defense Donald Rumsfeld has called a

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<sup>82</sup> US Department of the Army, Field Manual No. 5-102 – Countermobility, 14 March 1985, Chapter 7 – Denial Operations, Global Security.org, accessed 6 November 2010, <http://www.globalsecurity.org/military/library/policy/army/fm/5-102/index.html>.

<sup>83</sup> Interview with Ron Manley, 29 August 2008; "Final Decision on MC 14/3 – A Report by the Military Committee to the Defence Planning Committee on Overall Strategic Concept for the Defence of the North Atlantic Treaty Organization Area. North Atlantic Military Committee, MC 14/3 (Final), 16 January 1968."

<sup>84</sup> "Final Decision on MC 14/3."

<sup>85</sup> Defence Research Policy Committee, Chemical and Biological Warfare, Note by the Joint Secretaries, 10 May 1962. TNA DEFE 10/490.

<sup>86</sup> "Final Decision on MC 14/3."



capabilities-based approach – focuses less on who might threaten, or where, and more on how the threat will evolve and what is needed to deter and defend against such threats.<sup>87</sup>

### *Retaliatory Capabilities*

British chemical and biological weapons aspirations during the postwar period were influenced in part by the idea that you must possess a “like-for-like” deterrent capability. The belief was that in order to prevent attacks with chemical or biological weapons, you needed to possess similar weapons capable of an in-kind retaliatory strike. Many individuals thought that conventional weapons were not adequate enough to prevent the USSR from launching a chemical or biological attack against the UK and that a British retaliatory capability was a must.<sup>88</sup> After the defeats of Germany and Japan, the USSR emerged as the West’s primary postwar adversary. It was this indirect conflict that spurred the UK defence industry to undertake significant R&D programmes into new types of weapons. At the eighth meeting of the Cabinet Defence Committee in 1952 discussions revolved around the need for like-for-like deterrent capabilities. The minutes of the meeting read, “The Allies should not take up a position which would deprive them of their ability to use chemical or bacteriological warfare in retaliation if this were to their advantage.”<sup>89</sup> It was accepted at the time that the Soviet Union was able to launch a nuclear or chemical weapons attack against the UK, while it was suspected, though not confirmed, that they also possessed a biological weapons capability as well.<sup>90</sup>

Writing in 1956, Minister of Defence Walter Monckton stated that, “The policy of this country as a signatory of the Geneva Protocol has never been to prepare to initiate the use of chemical weapons in war, but rather to be prepared to retaliate in kind if attacked by chemical weapons.”<sup>91</sup> This was the prevailing thought in the UK right up

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<sup>87</sup> Donald H. Rumsfeld, “Transforming the Military,” *Foreign Affairs*, Volume 81, Number 3 (May/June 2002): 24.

<sup>88</sup> This is a common theme during the postwar period, right through the 1950s. Many references exist within The National Archives repository. These are but two; Memorandum by General Sir Nevil Brownjohn, Chief of Staff Officer, MoD - Policy for Chemical Warfare, D (53) 17, 25 March 1953. TNA DEFE 13/265; Biological Warfare Research and Development Policy D (53) 44, 12 October 1953. TNA CAB 11/4505.

<sup>89</sup> 8<sup>th</sup> Meeting of the Cabinet Defence Committee, D (52), 9 July 1952. TNA CAB 131/12.

<sup>90</sup> Chiefs of Staff Committee, Joint Intelligence Sub-Committee – Soviet Interests, Intentions and Capabilities-General, report by the Joint Intelligence Sub-Committee, 6 August 1947. TNA CAB 158/1.

<sup>91</sup> Cabinet Defence Committee, Chemical Warfare Policy, Memorandum by the Minister of Defence, 4 July 1956. TNA CAB 131/17.

until it renounced its offensive chemical weapons programme. It was clear from Monckton's comments that the MoD did not see the necessity of retaining either the offensive programme or its stockpile of mustard and tabun munitions.<sup>92</sup> The MoD seemed to believe that the current British atomic (and future thermonuclear) arsenal as well as the massive US nuclear and chemical programmes would provide enough of a deterrent capability against perceived Soviet aggression in Europe.<sup>93</sup> It is thought that the destructive power of early fission weapons did not provide the nuclear weapon states with as comprehensive a deterrent as was preferred. As John Baylis explains that, "once both sides had sufficient nuclear (fusion) weapons to annihilate the other, there would be no need to build more."<sup>94</sup> The 1952 US detonation of Ivy Mike, a 10.4 Mt fusion bomb dramatically changed the global strategic landscape. The sheer destructive capability of a thermonuclear weapon convinced UK policy-makers that the future of British strategic deterrence would be tied directly to the success of the *Grapple* test in the autumn of 1957.

The end of the Cold War has rendered much of the West's nuclear capability obsolete as an effective deterrent against the emerging threat of sub-state terrorist organizations. As a result, a few important questions need to be raised. First, do nuclear weapons still provide an effective deterrent capability in an ever-changing security climate? Can large, sub-state terrorist organizations be deterred by nuclear weapons when they pose a completely different set of strategic, tactical and logistical problems? Colin Gray argues that, "We can be certain that WMD have a prosperous future as a dimension to future warfare, because for many belligerents, or states and groups contemplating belligerency, there are no superior alternatives available to them."<sup>95</sup> Policy-makers have a difficult task ahead in mapping out a suitable response to the threats posed by these types of potential proliferators.

It is a commonly held belief that states desire certain types of weapons to help deter regional threats. For decades Iraq adhered to this fundamental strategic concept. Throughout the 1970s and 1980s Iraqi thoughts on deterrence were invariably focused

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<sup>92</sup> Report by the Inspector-General of the Royal Air Force on Visit to No. 31 Maintenance Unit – Llandwrog, Report No. 538, 3 May 1956 – TNA AIR 20/8730.

<sup>93</sup> Chemical weapons had been a factor in British strategic planning regarding the defence of Europe, since the emergence of Soviet threat in the aftermath of the Second World War. Defence Research Policy Committee, Review of Defence Research and Development Policy, Report to the Minister of Defence, 4 April 1950. TNA DEFE 10/26.

<sup>94</sup> John Baylis, *Ambiguity and Deterrence: British Nuclear Strategy 1945-1964* (Oxford: Clarendon Press, 1995), 189.

<sup>95</sup> Gray, *Another Bloody Century*, 287-288.

on two countries – Iran and Israel. Israel has been an unofficial nuclear power since 1970 and has remained deliberately ambiguous since.<sup>96</sup> Caught between a nuclear-armed power in Israel and a state with much larger conventional forces in Iran, Saddam Hussein saw in nuclear, biological and chemical weapons, a potentially valuable military and political instrument. The eight-year war with Iran proved to be a case study in proscribed weapons procurement for Hussein's regime.

After some early successes, Iraqi defensive positions were under constant threat of being overrun by Iranian forces. These poorly trained and ill-equipped troops were deployed in human wave attacks designed to overrun Iraqi positions through sheer numbers. In response to this Major General Maher 'Abd Rashid, while commanding the Iraqi Third Corps around Basra, commented that poison gas would be extremely difficult to use in a close-combat situation, but added, "if you gave me some insecticide that I could squirt at this swarm of mosquitoes, I would use it so that they would be exterminated, thus benefiting humanity by saving the world from these pests."<sup>97</sup> If these types of attacks had proven successful, Iranian troops would have had little difficulty in capturing Iraqi positions, albeit with significant loss of life. The ground offensives would have been a difficult enterprise for the Iraqi High Command to effectively counter. Chemical weapons provided Iraq with an effective force multiplier against Iranian human wave attacks.

For the UK, nuclear, biological and chemical weapons provided both a retaliation-in-kind deterrent and an initiatory capability against possible Soviet aggression in Europe. Eventually, with the acquisition of a thermonuclear weapon, the need for chemical and biological weapons seemed less.<sup>98</sup> Iraq, however, was a different case. Saddam saw threats both internally from the Kurds and Shia and externally from Israel and Iran. Different weapons provided different capabilities for the regime. Chemical weapons were used in large quantities in the Anfal campaign and on Iranian soldiers and civilians during the war. The regime's BW programme was notable. According to the UNMOVIC Compendium, Iraq stated that its BW programme was a stopgap measure because of the long lead-time involved in the development of a nuclear

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<sup>96</sup> See Avner Cohen, *Israel and the Bomb* (New York: Columbia University Press, 1998).

<sup>97</sup> Barry Hillenbrand, William E. Smith and Raji Samghabadi, "The Gulf: Clouds of Desperation," *Time*, 19 March 1984, accessed 26 April 2010, <http://www.time.com/time/magazine/article/0,9171,950036-3,00.html#ixzz0mEL2nD7K>.

<sup>98</sup> Interest in chemical warfare agents was renewed in 1963 with a Cabinet Defence Committee agreement to acquire a limited offensive chemical warfare capability.

programme and there was a need for a deterrent.<sup>99</sup> Here is a clearly defined link between nuclear and biological weapons. The regime felt it needed to possess a non-conventional strategic deterrent and due to multiple reasons acquiring a nuclear weapon was not very likely. Biological weapons could have provided Iraq with the strategic deterrent it clearly wanted. Hussein Kamel was in favour of acquiring a deliverable biological weapon that could be deployed against multiple targets inside Israel.<sup>100</sup> Resources were put towards this end, but for the regime, specifically Saddam, nuclear weapons would have provided the ultimate in strategic deterrence. Had the regime managed to acquire a nuclear deterrent capability, it would have dramatically altered the strategic and political landscape in the Middle East.

### *Security Assurances*

The threat of military retaliation is not the sole method for deterring internal or external threats. Distinct from this is the concept of a *negative security assurance* (NSA). The idea of an NSA has become a fundamental part of the regime established by the Nuclear Nonproliferation Treaty. In 1978, the First Special Session of the General Assembly devoted to Disarmament took place in New York from 23 May to 30 June and was the largest, most representative meeting of nations ever convened to consider the question of disarmament. This was a significant event as it was the first time in which the international community was able to achieve a consensus on a comprehensive disarmament strategy.

The resulting document contained a list of provisions, including Article 32, which reads:

All States, in particular nuclear weapon States, should consider various proposals designed to secure the avoidance of the use of nuclear weapons, and the prevention of nuclear war. In this context, while noting the declarations made by nuclear-weapon States, effective arrangements, as appropriate, to assure non-nuclear-weapon States against the use or the threat of use of nuclear weapons could strengthen the security of those States and international peace and security.<sup>101</sup>

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<sup>99</sup> This comment was made during the meetings of the Biology Technical Experts in Vienna from 20-27 March. This reference is not included in the subsequent Report of the United Nations Special Commission's Team to the technical evaluation meeting on the proscribed biological warfare programme, 1 April 1998, cited in UNMOVIC Compendium, Chapter 5, 775.

<sup>100</sup> Interview with Rod Barton, 24 April 2008.

<sup>101</sup> "Resolution adopted on the Report of the Ad Hoc Committee of the Tenth Special Session S-10/2, Final Document of the Tenth Special Session of the General Assembly." United Nations, 6.

The five recognized nuclear weapons states have all declared their commitment to the concept of negative security assurances.<sup>102</sup>

In the US for example, the 2010 *Nuclear Posture Review Report* is intended to provide a “roadmap for implementing President Obama’s agenda for reducing nuclear risks to the United States, our allies and partners, and the international community.”<sup>103</sup> The report states that:

In case of countries not covered by this assurance – states that possess nuclear weapons and states not in compliance with their nuclear non-proliferation obligations – there remains a narrow range of contingencies in which US nuclear weapons may still play a role in deterring a conventional or CBW attack against the United States or its allies and partners. The United States is therefore not prepared at the present time to adopt a universal policy that the “sole purpose” of US nuclear weapons is to deter nuclear attack on the United States and our allies and partners, but will work to establish conditions under which such a policy could be safely adopted.<sup>104</sup>

This contrasts considerably with the previous administration’s policy of deliberate ambiguity in response to possible WMD attacks. The 2002 US *National Strategy to Combat Weapons of Mass Destruction* states that, “the United States will continue to make clear that it reserves the right to respond with overwhelming force – including through resort to all of our options – to the use of WMD against the United States, our forces abroad, and friends and allies.”<sup>105</sup> Both of these documents make reference to the possibility of a nuclear reprisal in the wake of a chemical or biological weapons attack. This is a common example of a direct connection between nuclear weapons and chemical and biological weapons. There are differences in the wording of both reports, however, the current US administration seems much more interested in helping to create a system where the threat of nuclear retaliation is essentially a non-issue. The proliferation of non-conventional weapons is clearly a priority for President Obama as well, but the mechanism in place is a much different one when contrasted to that of the previous President.

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<sup>102</sup> “United Nations Security Council Resolution 984 – Adopted by the Security Council at its 3514<sup>th</sup> meeting, 11 April 1995.” United Nations. This “Takes note with appreciation of the statements made by each of the nuclear-weapon States (S/1995/261, S/1995/262, S/1995/263, S/1995/264, S/1995/265), in which they give security assurances against the use of nuclear weapons to non-nuclear-weapon States that are Parties to the Treaty on the Non-Proliferation of Nuclear Weapons.”

<sup>103</sup> US Department of Defense, *Nuclear Posture Review Report*, April 2010, i. Will be referred to as *NPR Report*.

<sup>104</sup> *Ibid.*, 16.

<sup>105</sup> The White House, *National Strategy to Combat Weapons of Mass Destruction*, 11 December 2002, 3, accessed 10 March 2010, <http://www.state.gov/documents/organization/16092.pdf>.

The problem with these NSA is whether they are or are not viewed as being credible. Critics of nuclear weapons believe that it would be difficult to justify the use of nuclear weapons in any capacity.<sup>106</sup> A deterrent is only valuable if the threat is deemed to be legitimate. In January 2006, French President Jacques Chirac openly declared that, "The leaders of states who would use terrorist means against us, as well as those who would envision using . . . weapons of mass destruction, must understand that they would lay themselves open to a firm and fitting response on our part."<sup>107</sup> Chirac's thinly veiled threat came at a time when American allies were being targeted by multiple terrorist organizations, with deadly attacks occurring in Indonesia, Turkey, Spain, India and the UK. It was Chirac's belief that France needed to restate its retaliatory posture implicitly in the hope of preventing attacks against its vital interests. Four years earlier, British Secretary of State for Defence Geoff Hoon, commented that the UK was prepared to use nuclear weapons against states such as Iraq if they were to use weapons of mass destruction against British interests.<sup>108</sup> Britain's nuclear posture is deeply intertwined with NATO. The Alliance's current Strategic Concept of April 1999 reaffirms its commitment to the governance of the Alliance's security and defence policy, its operational concepts, its conventional and nuclear force posture and its collective defence arrangements, and will be kept under review in the light of the

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<sup>106</sup> See Christopher H. Achen and Duncan Snidal, "Rational Deterrence Theory and Comparative Case Studies," *World Politics*, Volume 41, Number 2 (January 1989): 143-169; Scott D Sagan, "The Perils of Proliferation: Organization Theory, Deterrence Theory, and the Spread of Nuclear Weapons," *International Security*, Volume 18, Number 4 (Spring 1994): 66-107; Richard Ned Lebow, "The Deterrence Deadlock: Is There a Way Out?" *Political Psychology*, Volume 4, Number 2 (June 1983): 333-354; John Orme, "Deterrence Failures: A Second Look," *International Security*, Volume 11, Number 3 (Spring 1987): 96-124; Leon Wieseltier, "When Deterrence Fails," *Foreign Affairs*, Volume 63, Number 4 (Spring 1985): 827-847; Sean M. Lynn-Jones, "Offense-Defense Theory and Its Critics," *Security Studies*, Volume 4, Number 4 (December 1995): 660-691; John E. Mack, "Nuclear Weapons and the Dark Side of Humanity," *Political Psychology*, Volume 7, Number 2 (June 1986): 223-233; Steven J. Brams and D. Marc Kilgour, "Is Nuclear Deterrence Rational?" *PS*, Volume 19, Number 3 (Summer 1986): 645-651.

<sup>107</sup> Molly Moore, "Chirac: Nuclear Response to Terrorism Is Possible," *Washington Post*, 20 January 2006, A12.

<sup>108</sup> Hoon's full response was, "In terms of deterrence, clearly, our nuclear capability deters those who might threaten the United Kingdom with a weapon of mass destruction. I think we would have to have a rather longer discussion about whether that, for example, might work in relation to a failed state or a country like Iraq that, for example, places the lives of its own citizens at little value and might be prepared to contemplate taking on a nuclear power like the United Kingdom and accept the consequences. I think in terms of deterrence there is clearly an effect that our nuclear weapons have, but the reason and justification for the argument about states of concern is that some of those states would not be deterred in the way in which conventional deterrence theory assumes." "Select Committee on Defence, Minutes of Evidence, Examination of Witnesses (Questions 220-238) Rt. Hon. Geoffrey Hoon MP, Wednesday 20 March 2002." UK Parliament, accessed 26 April 2010, <http://www.publications.parliament.uk/pa/cm200102/cmselect/cmdfence/644/2032008.htm>.

evolving security environment.<sup>109</sup> The Strategic Concept is due to be reassessed in late 2010.<sup>110</sup>

## POLITICAL CONSIDERATIONS

Both domestic and international political issues can play a role in shaping nuclear, biological and chemical weapons policy decisions. The US Atomic Energy Act (AEA) was a key piece of legislation throughout the early years of the British nuclear weapons programme. It became a criminal offence for Americans to share nuclear information with any other state – irrespective of military or political affiliation. This meant that Canada and Britain, two of the biggest contributors to the wartime Manhattan Project, were denied access to information on the atomic bomb project. Military, scientific and political collaboration had reached a high-water mark during the Second World War, typified by the high level meetings in 1942-43 between Churchill and Roosevelt as well as specific agreements made between the two. In terms of nuclear collaboration, this all changed in August 1946 with the creation of the AEA, which prevented the transfer of information between the US and UK. This was a significant blow to US-UK scientific collaboration, but it would not prove to be the end. The relationship that the British had with the Americans was a complicated one, but one that was very important to both sides. When nuclear cooperation with the US ended, in order to reestablish the special relationship between the two, the UK must try and acquire a nuclear weapons capability.

Interestingly enough, this did not seem to cause problems in other areas of scientific collaboration between the wartime allies. August 1946, the very same month that President Truman signed the AEA into law, saw the founding meeting of the Tripartite Conference on collaborative research and development of chemical and biological agents and weapons, between the USA, UK and Canada.<sup>111</sup> At this time, R&D into biological agents and biological warfare had begun to receive a greater

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<sup>109</sup> “The Alliance's Strategic Concept, Approved by the Heads of State and Government participating in the meeting of the North Atlantic Council in Washington DC, 24 April 1999.” North Atlantic Treaty Organization, accessed 26 April 2010, [http://www.nato.int/cps/en/natolive/official\\_texts\\_27433.htm](http://www.nato.int/cps/en/natolive/official_texts_27433.htm).

<sup>110</sup> “NATO Foreign Ministers hold talks on new Strategic Concept, 22 April 2010.” North Atlantic Treaty Organization, accessed 26 April 2010, [http://www.nato.int/cps/en/natolive/news\\_62706.htm](http://www.nato.int/cps/en/natolive/news_62706.htm).

<sup>111</sup> Donald Avery, “The Canadian Biological Weapons Program and the Tripartite Alliance,” in *Deadly Cultures: Biological Weapons Since 1945*, ed. Mark Wheelis, Lajos Rózsa and Malcolm Dando. (Cambridge: Harvard University Press, 2006), 88.

priority in terms of scientific and political interest, on par with nuclear weapons.<sup>112</sup> As Brian Balmer explains, “more money and a great deal of political and military support had been injected into the postwar biological warfare research programme.”<sup>113</sup> The discontinuation of atomic collaboration with the US was a crucial factor in the elevation of BW in strategic importance for the UK.

Though there were a number of unresolved issues concerning development, such as agent selection, weaponization, delivery and anticipated effects, many, including the Chiefs of Staff, thought that biological weapons could provide the UK with a strategic deterrent in the immediate postwar period. A report by the Inter-Service Sub-Committee on Biological Warfare from March 1947 stated:

The potentialities of Biological Warfare and its possible imminence indicate the vital need for rapid progress in research especially on defensive measures, to safeguard the security of this country. We were advised by the former Deputy Chiefs of Staff Committee that research on Biological Warfare is of the highest priority and in the same category as research on atomic energy and research on guided missiles. Furthermore, the Deputy Chiefs of Staff considered that every endeavour should be made to advance research into Biological Warfare particularly as comparatively little effort in this field would achieve considerable results compared with equivalent expenditure in other fields.<sup>114</sup>

This is not to say that developing a biological weapons capability was an inevitable conclusion. Unlike chemical weapons, the large-scale dissemination of biological weapons had never been attempted. Scientists were developing a growing knowledge base of the effects particular agents may have if released, but post-event understanding of a biological warfare attack was simply unknown. At this early stage, most of the interest in BW was in the theoretical application of biological agents as weapons of war, as this type of novel warfare had yet to be fully operationalized. However, it was going to be Britain’s best chance at acquiring a weapon of strategic significance in the wake of the AEA.

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<sup>112</sup> Chiefs of Staff Committee, Shortage of Scientific Staff and Equipment for Research in Biological Warfare, Report by the Inter-Service Sub-Committee on Biological Warfare, 20 March 1947. TNA CAB 121/103.

<sup>113</sup> Balmer, *Britain and Biological Warfare*, 77.

<sup>114</sup> Chiefs of Staff Committee, Shortage of Scientific Staff and Equipment for Research in Biological Warfare, Report by the Inter-Service Sub-Committee on Biological Warfare, 20 March 1947. TNA CAB 121/103.



The Chiefs of Staff were convinced that a biological weapon, “comparable in strategic effect with the atomic bomb” could and should be developed.<sup>115</sup> The associated costs of producing a biological bomb were significantly lower than producing a nuclear weapon. The nuclear programme was operating on the ten-year principle that there would not be a war until 1957 and the planning process was directed to achieve an operational NW capability by then.<sup>116</sup> The Air Staff had a more aggressive target of 1955 for the entry into service of the anti-personnel biological bomb.<sup>117</sup> Either way it would take approximately ten years before either of the weapons would be serviceable. According to Balmer, “The fates of these two types of killing were not automatically coincident but instead were being knitted together through these various discussions, calculations and investigations.”<sup>118</sup> Eventually the biological bomb programme was scrapped and Britain became the world’s third nuclear power in 1952 with the success of the *Hurricane* test off the coast of Australia.

For the British there was nothing particularly alluring in having a CBW capability; the decisions were based on perceived necessity and military utility. Different factors entered into the equation when looking at nuclear decisions. Nuclear weapons provided the UK with benefits that chemical and biological weapons could not. For Britain, the ultimate prize was the reestablishment of the US-UK strategic partnership and the acquisition of an independent nuclear weapons capability was seen as a necessary component in the facilitation of this process. Once Britain acquired nuclear weapons, interest in offensive uses of chemical and biological weapons diminished, until 1963 and the decision to reestablish a limited chemical weapons retaliatory capability.<sup>119</sup>

In recent years, much has been made of former Foreign Secretary Ernest Bevin’s comments about putting a “Bloody Union Jack” on top of a made-in-Britain nuclear weapon. National prestige concerns have been previously viewed as critical to the development of the British nuclear weapons programme.<sup>120</sup> While it was something that the Attlee government was conscious of, it appears to have exerted little influence in the decision to develop nuclear weapons. The reestablishment of the close wartime

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<sup>115</sup> Chiefs of Staff Committee, BW Subcommittee. Note by Ministry of Supply, 17 November 1947. TNA WO 188/660.

<sup>116</sup> Interview with John Simpson, 6 August 2008.

<sup>117</sup> Air Staff Target No OR/1065, Biological Warfare Agents and Weapons, and the Associated Problems of their Storage and Handling Under Service Conditions. TNA AIR 20/8727.

<sup>118</sup> Balmer, *Britain and Biological Warfare*, 87.

<sup>119</sup> This will be discussed in the Strategic Issues section of this chapter.

<sup>120</sup> Peter Hennessy, “How Bevin saved Britain’s Bomb,” *The Times*, 30 September 1982, 10.

collaboration that Britain shared with the US in political and military affairs was the driving force behind the nuclear programme.<sup>121</sup>

In a similar vein, military utility and necessity were not the sole driving forces behind Iraq's nuclear programme. National prestige was a significant factor in Iraq's desire to develop NBC weapons. Nuclear weapons in particular were viewed by the regime as being the pinnacle of military science and technology. At that time no Arab state possessed nuclear weapons. Saddam's view of himself and Iraq was such that it made sense for the regime to have nuclear weapons. Iraq's history was full of scientific innovation and advancement and Saddam saw nuclear weapons as part of the natural progression of Iraq's position in the international system. When the Israeli Air Force destroyed the Osirak reactor during Operation *Babylon*, the possibility of the regime developing plutonium-based nuclear weapons was greatly reduced. Saddam's personal ego was not going to allow Iraq to be without weapons that could elevate the status of the regime within the Middle East and the larger Arab world.<sup>122</sup>

The previous year hostilities between Iraq and Iran had broken out. Chemical weapons were being used by Iraq's military against invading Iranian troops. There is little doubt that the regime saw concrete utility for the application of chemical warfare. What is less clear is how the regime saw biological weapons and the potential to wage indiscriminate germ warfare against its enemies. As mentioned earlier, Iraq's BW programme was expanded in 1985 to include R&D work, which was viewed as necessary for the production of agents on a laboratory scale.<sup>123</sup> Under the guidance of British-educated microbiologist Rihab Taha, R&D into a few different pathogens was undertaken, including anthrax, botulinum toxin and *Clostridium perfringens*.<sup>124</sup> If the nuclear option were not available to the regime, then biological weapons would provide Iraq with a non-conventional deterrent capability.

This was similar to the conditions in the UK during the immediate postwar period when the AEA came into being. Britain was temporarily shut out from nuclear collaboration with the US. It makes sense that when one option is removed, then interest in acquiring what is perceived to be the next best thing will develop. For both the UK and Iraq, this meant biological weapons. The belief that biological weapons could be utilized as a credible strategic deterrent was strong in both cases. For the UK, the

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<sup>121</sup> Interview with John Simpson, 6 August 2008.

<sup>122</sup> Interview with Tim Trevan, 5 April 2008; Interview with Charles Duelfer, 10 April 2008.

<sup>123</sup> UNMOVIC Compendium, Chapter 5, 777.

<sup>124</sup> ISG Report, III, Biological Weapons Programme, 9.

Defence Research Policy Committee, the Air Staff and the Chiefs of Staff thought this, though little was understood about using biology for weapons.<sup>125</sup> For Iraq, biological weapons represented a significant technological achievement and one that could potentially deter future Israeli or Iranian aggression.

### *Individuals of Influence*

Another area that can provide evidence of connections between nuclear weapons and CBW centres on key personnel. Due to the Iraqi regime's desire for secrecy, few individuals had qualitative knowledge on more than one of the weapons programmes. Hussein Kamel, the head of MIC, was the minister in charge of the chemical and biological weapons programmes. Kamel was also intimately involved with the highly secretive gas centrifuge programme, which fell outside the direct control of the IAEC. Kamel himself did not have any technical understanding of nuclear energy issues, nor did he have a formal decision-making role in technical matters.<sup>126</sup> The programme's chief scientist, Mahdi Obeidi, made these decisions.<sup>127</sup> Kamel had a unique perspective on the three programmes as very few individuals had tacit knowledge about what was going on in the other programmes. Many high-ranking regime officials and Saddam's inner coterie all would have been aware of the existence of the NBC programmes, but their knowledge of programme specifics would not have been very significant. Kamel's relationship with Saddam and his effectiveness as a manager meant that he was rewarded with key regime positions. His ability to procure resources and his access to Saddam made him the logical choice as the person responsible for the gas centrifuge programme. Obeidi provided the scientific expertise and Kamel provided the clandestine programme with money, men and facilities in which to work.

There may be cases of other individuals that were involved in some facet of the NW and CBW programmes. As previously mentioned, chemists, physicists, mathematicians and certain types of engineers could have been employed in different areas of any of the three programmes. Most aspects of the programmes were highly secretive and compartmentalized which meant that individuals working on certain

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<sup>125</sup> Defence Research Policy Committee, Final Version of a Paper on Future of Defence Research Policy, 30 July 1947. TNA DEFE 10/19; Air Staff Requirement for a Biological Bomb, OR/1006, 10 May 1947. TNA AIR 20/8727; Chiefs of Staff Committee, BW Subcommittee, Note by Ministry of Supply, 17 November 1947. TNA WO 188/660.

<sup>126</sup> Interview with Jacques Baute, 25 April 2008.

<sup>127</sup> Ibid.

biological agents, chemical weapons, delivery systems or enrichment programmes were less likely to be fully aware of what else was occurring around them. Outside of Saddam and a few ministers, the circle of information was very small.

The situation in the UK was much the same. A core group of government officials and military personnel were aware of the existence of the nuclear, biological and chemical weapons programmes. The way in which Cabinet decisions were made meant that a small yet key group of ministers and advisors were involved in the formation and direction of policy. Outside of policy-making circles, a select number of advisory panels or committees were formed to deal with specific programmes or issues within the programmes. The Defence Research Policy Committee was established in 1947, under the auspices of the MoD. Its terms of reference were to:

Formulate a coherent scientific policy covering the whole range of defence research, paying due consideration to the priorities to be observed in research and the effort to be devoted to each objective, and relating the progress of scientific development both at home and abroad to the operational requirements formulated by the Chiefs of Staff.<sup>128</sup>

As E. C. Williams explains, “the functions of the DRPC were to advise the Minister of Defence and the Chiefs of Staff on matters concerned with the formulation of scientific policy in the defence field and also to advise on the allocation and distribution of scientific resources between fields and between Services.”<sup>129</sup> The DRPC was purely an advisory body and did not have any executive authority.

Sir Henry Tizard, the MoD’s Chief Scientific Adviser was installed as the first chairman of the DRPC. Tizard was also the chairman of an *ad hoc* committee of scientists that had compiled a report entitled *Future Developments in Weapons and Methods of War* on behalf of the wartime coalition government. Tizard’s report addressed nuclear, biological and chemical weapons concerns, though they had been forbidden access to information on the wartime Manhattan Project.<sup>130</sup> The DRPC was less involved in the nuclear programme as it fell under the control of the Ministry of Supply. As Margaret Gowing explains, “the atomic energy project was already regarded as something whose self-contained and elevated status was above debate: other departments and organizations could become involved in its problems only in order to

<sup>128</sup> Memorandum, Cabinet Defence Committee, Central Direction of Scientific Effort. Report by the Chiefs of Staff, DO (46) 82, 2 July 1946. TNA AVIA 54/952.

<sup>129</sup> E. C. Williams, “Science and Defence,” *Public Administration*, Volume 34, Number 3 (September 1956): 260.

<sup>130</sup> Chiefs of Staff Committee, *Future Developments in Weapons and Methods of War*, Report by Sir Henry Tizard’s ‘Ad Hoc’ Committee, 16 June 1945. TNA CAB 121/271.

help, never to question.”<sup>131</sup> Tizard and the DRPC would not play much of a part in the facilitation of the early British nuclear programme.

As a result of the DRPC being excluded from influencing the atomic programme, Tizard was keen to promote chemical and biological weapons as potential alternatives to nuclear weapons. According to Agar and Balmer, “from the DRPC’s inception in 1947 two interlinked features can be seen: a continuing effort to secure greater flows of information about atomic projects and sympathy toward proposals for CW and BW research and development.”<sup>132</sup> This is an interesting connection. Because the DRPC had little to no influence in nuclear weapons matters, prior to 1954, when the administration of the atomic programme was reformed, they saw an opportunity to promote other types of non-conventional weapons as competitors to nuclear weapons. Both chemical and biological weapons were promoted, beginning in 1947, with the enthusiasm for BW starting to decline in mid-1950.<sup>133</sup> Chemical weapons lasted a bit longer, until July 1956, when the Cabinet Defence Committee took the decision to renounce its offensive CW capability.<sup>134</sup> Having been brought into the atomic sphere in 1954, the DRPC would continue in this capacity until 1963 when it was replaced by three new administrative bodies.<sup>135</sup> The situation the DRPC found itself in from its inception, where it was excluded from exerting any influence over nuclear matters, meant that they would try and promote chemical and biological weapons as viable alternatives to nuclear weapons. Within the CBW field, the DRPC had real influence and as we have seen, was more than willing to exert said influence over British defence policy decisions.

The examples of Hussein Kamel, the DRPC and Sir Henry Tizard show that a certain individuals or small advisory groups can have some level of influence relating to aspects of a nuclear, biological or chemical weapons programme. Until his defection in 1995, Kamel had the ear of Saddam and was able to maneuver himself into a unique and

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<sup>131</sup> Margaret Gowing and Lorna Arnold, *Independence and Deterrence, Volume II, Policy Execution* (London: Macmillan, 1974), 33.

<sup>132</sup> Jon Agar and Brian Balmer, “British Scientists and the Cold War: The Defence Research Policy Committee and Information Networks, 1947-1963,” *Historical Studies in the Physical & Biological Sciences*, Volume 28, Number 2 (1998): 216.

<sup>133</sup> Memorandum, BW Policy, Note by the Chairman, BW Subcommittee, 1 May 1950. TNA DEFE 10/26.

<sup>134</sup> Cabinet Defence Committee, Chemical Warfare Policy, Memorandum by the Minister of Defence, 4 July 1956. TNA CAB 131/17.

<sup>135</sup> The three new administrative bodies were a Defence Research Committee (DRC), a Weapons Development Committee (WDC) and an Operational Requirements Committee (ORC). Agar and Balmer, “British Scientists and the Cold War,” 246.

influential position within the regime. Being the person in charge of the clandestine biological and chemical programmes as well as the gas centrifuge enrichment programme meant that he was able to influence the direction of the programmes, and it was his desire to be the one who was able to provide the regime with its much sought after non-conventional weapons capability.<sup>136</sup> While Tizard and the DRPC were not able to influence nuclear policy – at least until 1954 – they were able to offer scientific and technical advice and direction on CBW weapons issues and promoted this technology as an alternative to nuclear weapons, until it was wound up in 1963. Key individuals, advisory boards and policy groups can all have some influence on NBC weapons issues and Hussein Kamel and the DRPC provide good examples of exactly this.

## **ECONOMICS AND FINANCES**

There are a number of issues that can influence a state's attempts at acquiring a nuclear, biological or chemical weapons capability. Access to fissile material, chemical precursors and biological pathogens, specialized equipment along with detailed technical knowledge of the particular agents/weapons is of extreme importance to any state pursuing NBC weapons. Having a substantial pool of well-trained and scientific and technical personnel capable of contributing to a weapons programme is also important. It takes a lot of resources to be able to research and develop a nuclear, biological or chemical weapons capability, let alone all three. Highly industrialized states like the USA and the former Soviet Union had large, well-developed NBC programmes as well as sizeable conventional forces. For example, it is estimated that over a ten-year period beginning in 1972, the amount Soviet nuclear weapons had increased threefold an estimated 12 to 14% of Soviet gross national product<sup>137</sup> (GNP) was devoted to defence, as compared to 8% in the United States.<sup>138</sup>

For a country recently out of a devastating world war, economic considerations were of the highest concern. Iraq on the other hand, had its own concerns – somewhat

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<sup>136</sup> Interview with a Senior UNSCOM Official, 31 March 2008; Interview with Charles Duelfer, 10 April 2008.

<sup>137</sup> The Gross National Product is the value of all the goods and services produced in an economy, plus the value of the goods and services imported, less the goods and services exported.

<sup>138</sup> UN Chronicle, "Nuclear arms: positions of the 'Super-Powers' - United Nations 1983 General Assembly, February 1984."

different from those of the UK. Iraq, being an oil rich nation and part of OPEC<sup>139</sup> was in a financially different position as compared with some of its Middle East neighbours. From 1980 to 1991, Iraq was in a constant state of battle-readiness due to its eight-year war with Iran and its incursion into Kuwait in 1990; consequently defence spending was high. The Iran-Iraq War cost an estimated \$54.7 billion US in arms purchases alone.<sup>140</sup> Lots of money was flowing into the army as well as into the regime's weapons development programmes. Though Iraq had harnessed its greater scientific and technical communities as well as allocating vast amounts of money, they still were not able to develop a nuclear programme or a comprehensive BW programme.

### *Scientific Communities*

Iraq possessed a well-trained and well-educated scientific community.<sup>141</sup> Many of their top scientists working in the weapons programmes were educated and trained in the West.<sup>142</sup> Of the pre-*Desert Storm* nuclear, biological and chemical programmes, the nuclear programme was the largest in terms of size and scope. Many facilities were utilized, including the Al Safa'a EMIS Plant at Tarmiya, Tuwaitha Nuclear Research Center as well as Al Rashdiya, the site of Iraq's centrifuge programme. It was thought that the nuclear programme comprised several thousand staff prior to the invasion of Kuwait.<sup>143</sup> According to ISG:

Efforts that could preserve the progress and talent that had been developed up to the 1991 war included keeping the nuclear cadre engaged in a variety of projects, such as rebuilding of Iraq's infrastructure. However the nuclear program was ended and the intellectual capital decayed in the succeeding years.<sup>144</sup>

The ability of the regime to reconstitute the nuclear programme after *Desert Storm* was severely hampered, even though great pains were taken to deceive IAEA inspectors as to its existence.

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<sup>139</sup> The Organization of Petroleum Exporting Countries.

<sup>140</sup> ISG Report, I, Regime Finance and Procurement, 19.

<sup>141</sup> Interview with Jan Hillerman, 19 August 2008.

<sup>142</sup> Mahdi Obeidi, Amir al-Saadi, Rihab Taha, Khidir Hamza, Ja'far Diya' Ja'far and Hussain al-Shahristani all had received formal education and training in the West.

<sup>143</sup> Shayam Bhatia and Daniel McGrory claim that by 1990 the clandestine nuclear programme employed 20 000 skilled personnel. However, the Iraq Survey Group did not get a good sense of the numbers of personnel working in the nuclear programme. Shayam Bhatia and Daniel McGrory, *Saddam's Bomb* (London: Time Warner, 2002), 175.

<sup>144</sup> ISG Report, II, Nuclear Programme, 5.

In terms of personnel involved in the chemical programme, it has been estimated that from 1981 to 1991, between 1500 and 2000 individuals participated, including 60 PhD specialists, some 200 engineers and about 600 technicians, who operated equipment.<sup>145</sup> Interestingly, about 80% of the PhD specialists and 40% of the engineering force were either educated or trained in foreign countries. Out of the three programmes, the biological programme was the smallest in size and scope. It is thought, from data gathered from interviewees, that about 100 people were involved directly in the BW programme and of this 100 only about 25 or so were key personnel involved in research, production, field-testing or weaponization.<sup>146</sup> The biological programme, being the smallest and also the last one to be pursued, was allocated a relatively small share of over-all resources.<sup>147</sup> Since these were clandestine programmes, it must be said that there is some difficulty in ascertaining the exact numbers of individuals working in each of the weapons programmes. According to the ISG Report:

The precise population of participants in Iraq's WMD programs is impossible to quantify. A senior Iraqi official associated with the pre-1991 program stated that the numbers of WMD-associated scientists reported in Iraq's declarations to the UN were grossly inflated to confuse inspectors... There probably were no more than approximately 1100 scientists and possibly as few as 600 with core expertise specific to WMD research, development and production requirements. However none of these figures can be verified.<sup>148</sup>

Though precise numbers cannot be accurately verified, Iraq's NBC programmes were well funded and staffed with the best and brightest individuals their scientific community had.

It is also unclear as to the effect the sizes of each of the weapons programmes had on each other. Certain types of scientists and technicians could have been engaged in any of the three programmes. Mathematicians, physicists, chemical engineers and many different types of technical personnel would have been in high demand. Since the nuclear programme was considered to be of the highest value, one can presume that it received a sizeable amount of skilled and competent individuals. As a result, the nuclear programme was very professional in its organization and conduct.<sup>149</sup> Unfortunately little

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<sup>145</sup> UNMOVIC Compendium, Chapter 6, 1053.

<sup>146</sup> *Ibid.*, 1054-1055.

<sup>147</sup> *Ibid.*

<sup>148</sup> Addendums to the Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD, 1.

<sup>149</sup> Interview with Jacques Baute, 25 April 2008.



documentary evidence exists highlighting the cross-programme competition for top scientific personnel.

Britain's scientific community was strongly utilized during the period of NBC weapons development. The personnel requirements were enormous. The atomic energy programme alone needed large numbers of highly qualified scientists and engineers, who had to be supported by many other kinds of workers – draughtsmen, technicians, craftsmen, executives, clerks, typists, storekeepers, drivers, labourers and so on.<sup>150</sup> Margaret Gowing states:

The staff within the atomic project had to be built up, organized and trained at a time of national manpower shortage, in competition with various other urgent postwar demands, and without direction of labour; this meant that people had to be attracted to join the project and, once in, retained.<sup>151</sup>

Highly trained individuals were difficult to come by for the British nuclear programme in the early years. Pay scales were not in line with the rest of British industry and as a result recruitment drives were frequently coming up short. The numbers of individuals needed to fill out manpower requirements did pose a problem as private sector firms were competing with the civil service for the best and brightest scientific and technical minds.<sup>152</sup>

The nuclear programme was not only competing with the chemical and biological programmes for suitably qualified personnel, it was competing with British industry. There were many employment opportunities for young, enterprising scientists in the postwar period. The nuclear energy project was but one. Gowing also states that:

Outside the project's own confines, large demands were made on manpower in other parts of the Ministry of Supply, such as the chemical and engineering inspectorates and the headquarters administrative branches; in the Ministry of Works, which was in charge of the project's huge civil engineering and construction programme; in Government scientific establishments such as the Chemical Research Laboratory; and in industry, both the building and construction industry and the firms – notably ICI<sup>153</sup> – which carried out research and development contracts or supplied materials and components.<sup>154</sup>

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<sup>150</sup> Gowing and Arnold, *Independence and Deterrence, Volume II*, 58.

<sup>151</sup> *Ibid.*, 59.

<sup>152</sup> Note of a Meeting held on 20 October at the Treasury to consider the Future Conditions in Remuneration of Scientific Staff, 10 November 1944. TNA T 162/802.

<sup>153</sup> Imperial Chemical Industries.

<sup>154</sup> Gowing and Arnold, *Independence and Deterrence, Volume II*, 58.

By the time of the *Hurricane* test, it is estimated that the total strength of the workforce involved with the nuclear weapons programme was 15 000, including industrial employees and non-industrial ancillary staff.<sup>155</sup> The numbers of individuals involved with the programme steadily increased up to the *Hurricane* test.

The economic situation in Britain during the postwar period was such that specific problems arose that impinged upon the ability of the nuclear, biological and chemical weapons programmes to prosper. There was a shortage of trained scientists and technicians required for each of the programmes. Infrastructure was a problem in the beginning with significant investment required to build nuclear reactors, laboratories and processing facilities. Housing was a major concern as well. After the war there was a critical shortage of housing, not only for people working near these facilities, which were often located in fairly remote locations, but for the larger civilian population of the UK as well. The first few years after the end of the war were extremely difficult for a large percentage of the population. But by 1950, the welfare state was created and the housing crisis had largely abated, due to a massive investment of capital.

There is little doubt that from 1946 onwards, the development of a nuclear weapons programme was the principal concern from the perspective of the British government in regard to the defence industry. British involvement in the Manhattan Project was considerable and after the *Trinity* tests in New Mexico and the atomic bombing of Japan, many British scientists returned to the UK. Some of the repatriated scientists had become familiar in areas such as theoretical physics, bomb design and implosion techniques.<sup>156</sup> Many of these individuals would form the core group of nuclear scientists that would have the responsibility of developing a deliverable British nuclear weapon.

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<sup>155</sup> In May 1946 a report entitled *Scientific Manpower: Report of a Committee Appointed by the Lord President of the Council* was published. Chaired by Sir Alan Barlow, this report put forth the idea that the need for qualified scientists, defined as 'persons holding degrees in the mathematical, physical, chemical and biological sciences, together with the small number of men and women who, without being university graduates, are members of recognized scientific institutions with a membership status that is accepted as the equivalent of a university degree in these subjects,' would rise to approximately 70 000 in 1950 and 90 000 in 1955. As a result, major investment was made into increasing the number of university science graduates in the UK. *Scientific Manpower: Report of a Committee Appointed by the Lord President of the Council*, Cmd. Paper 6824 (London: His Majesty's Stationery Office, 1946), 3-7.

<sup>156</sup> William Penney was the only British scientist working at Los Alamos that had detailed knowledge on the bomb's implosion techniques. Gowing and Arnold, *Independence and Deterrence, Volume II*, 6-7; Cathcart, *Test of Greatness*, 26-47.

### *Opportunity Costs*

In terms of opportunity costs, the postwar development of nuclear weapons in the UK came at a price.<sup>157</sup> The financial and social implications of the Second World War meant that some tough decisions needed to be made. Food and petrol rationing was still in place in the early 1950s and Britain had started to repay its massive war debts. Significant investment was made into creating Britain's "cradle to grave" state-run, social security system.<sup>158</sup> Britain was no longer in a position financially, to maintain the wartime size of its conventional forces. With the emergence of the Soviet Union as the predominant security threat, the need for a comprehensive strategic deterrent was never higher. Unfortunately, Britain had been shut out of nuclear collaboration with its wartime ally the United States. With the threat of Soviet incursions into Western Europe and Britain's shrinking defence budget, decisions needed to be made in how best to provide the UK with a strategic deterrent option. One would think that finding money for the fledgling nuclear programme would have been difficult during this time, but this was not the case – over £100 million was spent on the nuclear programme between 1946 and 1952. With a significant amount of money, labour and material going into the nuclear programme, it was not unforeseen that there would be spending cuts in other military programmes.<sup>159</sup> As Margaret Gowing explains, "All in all, sufficient resources for the project had been procured at some cost – small in total but important at the margin – to the rest of the economy. But they had been barely adequate."<sup>160</sup>

With the success of the *Hurricane* test in 1952, Britain joined the nuclear club. With the importance of biological weapons already in decline, the offensive production of chemical weapons was soon to find a similar fate. Four years after *Hurricane*, on 10 July 1956, Prime Minister Anthony Eden and the Cabinet Defence Committee took the

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<sup>157</sup> An opportunity cost is defined as the value of a product forgone to produce or obtain another product. William J. Weida explains that opportunity costs occur at three major points, which are: (a) when the weapon is built and purchased and the significant radioactive and hazardous waste involved in this process is safely disposed of (although this latter activity may not occur until decades after a weapon is built); (b) when the weapon is deployed and maintained; and (c) when the weapon is decommissioned and the additional nuclear waste generated by decommissioning must be safely stored. William J. Weida, "The Economic Implications of Nuclear Weapons and Nuclear Deterrence," in *Atomic Audit: The Costs and Consequences of US Nuclear Weapons Since 1940*, ed. Stephen I. Schwartz. (Washington: Brookings Institute, 1998), 530.

<sup>158</sup> Sidney Pollard states that, Britain did not spend significantly more on the social services after 1948 than she did before 1939, apart from the retirement pensions. The outlay on many services, in real terms or as a proportion of national income, had actually fallen. Sidney Pollard, *The Development of the British Economy: 1914-1990* (London: Edward Arnold, 1992), 226.

<sup>159</sup> For an analysis of the costs of the British nuclear weapons programme see, Gowing and Arnold, *Independence and Deterrence: Volume II, Policy Execution*.

<sup>160</sup> *Ibid.*, 81.

decision to discontinue offensive production of chemical weapons. A memorandum by the Minister of Defence dated 4 July stated:

One cannot predict what situation would face the Government of the day if war broke out and an enemy used chemical weapons but I feel myself that our possession of nuclear weapons and the massive American nuclear armoury together with their chemical warfare potential justify us in or present economic circumstances in abandoning our own capacity to wage offensive chemical warfare.<sup>161</sup>

At this point, the UK already had a modest stockpile of Blue Danube nuclear weapons<sup>162</sup> and was some fifteen months away from the successful testing of a thermonuclear weapon.<sup>163</sup> The size of the Britain's conventional forces as well as other programmes were in the process of being scaled back. British defence expenditures decreased from 10.5% of GNP in 1952-53 to 9% in 1955-56.<sup>164</sup> The offensive component of the chemical weapons programme was a casualty of the economic state of the UK and fate of the biological weapons programme was inextricably tied to its larger relative. Research would still continue in these two fields until 1963, but the focus would be primarily defence-based.

The offensive chemical and biological weapons programmes were casualties of Britain becoming a nuclear weapon state. With austerity measures in place and the creation of a comprehensive social welfare state needing significant resources, defence spending was bound to become a casualty of the times. N. J. McCamley states, "All other military expenditure was secondary to Britain's quest for nuclear weapons."<sup>165</sup> Personnel reductions in the armed services were continuing throughout this period as well. Keeping men in the field was costly and not the best use of resources. Spending £100 million on a nuclear weapons programme however was. The success of the nuclear programme helped to reestablish the special relationship between the wartime allies and provided the UK with a strategic deterrent option that it did not previously possess. This example shows us how the existence of nuclear weapons can influence decisions on

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<sup>161</sup> 13<sup>th</sup> Meeting of the Cabinet Defence Committee, Chemical Warfare Policy – Memorandum by the Minister of Defence. TNA CAB 131/17.

<sup>162</sup> According to the Controller of Atomic Weapons, General Sir Frederick Morgan, by early 1955 the RAF was in possession of 20 "unproven service weapons of 10-12 kt yield less certain components." Report by General Sir Frederick Morgan, 19 January 1955. TNA AVIA 65/822.

<sup>163</sup> John Simpson, *The Independent Nuclear State: The United States, Britain and the Military Atom* (London: Macmillan, 1983), 110.

<sup>164</sup> Note to Sir R. Powell from ALM Cary on Gross National Product and Defence Expenditure, 19 September 1955. TNA DEFE 7/964.

<sup>165</sup> N. J. McCamley, *The Secret History of Chemical Warfare* (Barnsley: Pen and Sword Military Classics, 2006), 171.

chemical and biological weapons from an economic perspective. Maybe if the UK had emerged from the most destructive war in human history less financially crippled, the decision to discontinue the offensive components of the chemical and biological weapons programmes may not have needed to be taken. This was not the case and once the UK became a nuclear weapon state, it was only a matter of time until CBW issues were relegated to sidelines.

The situation in Iraq was much different. In terms of opportunity costs, it is less clear as to the extent in which they played in Iraq's decisions to research and develop nuclear, biological and chemical weapons. Lots of capital was invested in the nuclear programme, including the purchase of the Osirak research reactor, as well as the many different attempts at uranium enrichment, and exploring the production and separation of plutonium. Resources were allocated to the different teams in hope that one of them would be able to enrich uranium successfully.<sup>166</sup> The chemical and biological programmes were under the auspices of the Military Industrial Commission, run by Hussein Kamel. According to one senior UNSCOM Official, Kamel was a powerful and influential member of the regime, able to procure substantial funding for these programmes, including the gas centrifuge programme, much to the dismay of many senior military figures.<sup>167</sup>

Many politicians and military commanders of the regime firmly believed that the introduction of chemical weapons against the Iranians was the most significant point of the war and was the sole reason they were able to repel repeated human wave attacks.<sup>168</sup> Iraq had put some effort into creating a binary chemical warhead to be fitted onto the al-Hussein missile as well as binary bombs.<sup>169</sup> Not a binary where two inert chemicals would mix in-flight to create a toxic compound to be released upon impact, Iraq's warhead consisted of someone filling the warhead with the compounds prior to the missile's launch.<sup>170</sup> ISG had found that Iraq had used its pre-*Desert Storm* stockpiles of 152mm and 155mm high-explosive artillery rounds as well as the 122mm SAKR-18 high-explosive artillery rockets as chemical improvised explosive devices (IED) during Operation *Iraqi Freedom*.<sup>171</sup> It is possible that the insurgents who constructed the IED did not know that they were using old *Desert Storm* chemical rounds. Not limited to

<sup>166</sup> United Nations Security Council Report, S/1997/779, 8 October 1997, 35-47.

<sup>167</sup> Interview with a Senior UNSCOM Official, 31 March 2008

<sup>168</sup> Interview with Steve Black, 8 April 2008.

<sup>169</sup> Interview with a Senior UNSCOM Official, 31 March 2008

<sup>170</sup> Interview with Ewen Buchanan, 31 March 2008.

<sup>171</sup> ISG Report, III, Chemical Programme, 97-101.

first generation chemical agents, Iraq was successful in engineering both G-agents as well as VX nerve agent. During the war with Iran, the agents used were sufficiently toxic, but lacked stability, which made them more difficult to handle. This was not seen to be a significant problem as the agents were being produced and then shipped to the front shortly thereafter. They were not thinking about creating huge stockpiles of agents, therefore it was not that important that they have chemical agents that remain effective when stored over long periods of time.

Looking at the nuclear programme, one can see that there was some competition between the programmes created to consider the uranium enrichment question. It was important for the heads of each of the programmes to be able to be the one to inform Saddam that they had successfully solved the enrichment problem. Success in one programme could mean personal wealth and prosperity, without fear of reprisal.<sup>172</sup> Failure was not an option. Saddam's inability to receive negative news was well known inside Iraq and as a result he rarely received it. This caused a considerable problem as Saddam was frequently making weapons-related decisions without complete information. This helps to explain some of the anachronistic weapons-related decisions that were made. In essence what you had were different groups, acting independent of each other, trying to solve the same problem.<sup>173</sup> The resources that went to the laser enrichment programme could have been put to better use. Iraq's eventual success with calutrons reinforces the thinking that older, less sophisticated technology was the way forward for the nuclear programme. It is unlikely that the individual scientists working in each of the enrichment programmes had much knowledge of the competing programmes. They were most likely aware that other programmes existed and that it was in their best interests to achieve a modicum of success.

Financial constraints as well as a lack of highly trained personnel did not seem to inhibit the regime's NBC ambitions. The methods employed by the regime had a bigger effect upon the ultimate success or failure of the programmes. The culture of fear that surrounded the scientific community was considerable. Many senior programme scientists were arrested and jailed due to their perceived failure to develop NBC weapons. Individuals caught expressing doubt over the possibility of programme

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<sup>172</sup> Interview with Charles Duelfer, 10 April 2008.

<sup>173</sup> Interview with Steve Black, 8 April 2008.

success would run the risk of being accused of being unpatriotic.<sup>174</sup> Such accusations were more than enough to incur prison time in Saddam's Iraq.<sup>175</sup>

During the 1980s the Iraqi regime was investing in nuclear, biological and chemical weapons research and development. The ISG Report states that, "given Iraq's large oil revenues of the 1970s and early 1980s, Saddam was able to ambitiously pursue a state-controlled economy without having to choose between solvency and other priorities, such as health and welfare programmes, infrastructure development and development of his armed forces."<sup>176</sup> The eight-year war with Iran devastated the economy, resulting in Saddam trying to create growth through strange economic reforms such as abolishing universal employment labour laws and the privatization of key government industries.<sup>177</sup> This however did not impact upon the regime's NBC ambitions. It was still a priority for the regime, particularly Saddam, to be in possession of a non-conventional weapons capability. The economy suffered, as did the Iraqi middle-class, as a direct result of Saddam's unusual and sometimes draconian reforms. The proscribed weapons programmes did not. The Invasion of Kuwait and subsequent conflict further depleted Iraq's oil wealth. Gradually it became increasingly more difficult for the regime to reconstitute their proscribed weapons programmes. Interestingly, while the regime favoured a nuclear programme first and foremost, this did not impact that much on the levels of support that the chemical and biological programmes received. Saddam remained convinced that Iraq needed to possess a non-conventional weapons capability and he was prepared to allocate whatever resources were needed to see these plans through.

## FUTURE CHALLENGES

The emergence of new types of non-conventional or *asymmetric* threats has created a new set of challenges. NATO experiences in the Afghanistan theatre of operations have brought the issue of hardened and deeply buried targets (HDBT) to the fore. A US Department of Defense report defines HDBT as, "an adversary's threatening

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<sup>174</sup> Interview with Rod Godfrey 7 May 2008.

<sup>175</sup> Dr. Hussain al-Shahristani was imprisoned and tortured at Abu Ghraib prison for eleven years. He was imprisoned for religious activities when he expressed concerns about Iraq's ability to produce plutonium. Shahristani was in charge of the plutonium extraction project. Khidhir Hamza with Jeff Stein, *Saddam's Bombmaker: The Daring Escape of the Man Who Built Iraq's Secret Weapon* (New York: Simon & Schuster, 2000), 116.

<sup>176</sup> ISG Report, I, Regime Finance and Procurement, 19.

<sup>177</sup> *Ibid.*, 21.

and well protected assets in structures ranging from hardened surface bunker complexes to deep tunnels.”<sup>178</sup> These facilities can be used for a multitude of purposes ranging from leadership shelters, command and control centres, personnel housing, and they can provide a secure facility for chemical and biological weapons laboratories and weapons stockpiles. Figures obtained through the US intelligence community estimates that there are currently more than 10 000 HDBT worldwide and anticipates a significant increase in that number in the coming decade.<sup>179</sup>

Interest in different types of weapons has, at certain times, risen in profile. The current situation in Afghanistan had brought the debate over new types of earth penetrating weapons (EPW), both nuclear and non-nuclear into prominence. The 2001 *Report to Congress on the Defeat of Hardened and Deeply Buried Targets* states that a nuclear weapon can destroy chemical or biological agents that underground facilities may house without spreading the agent further.<sup>180</sup> There are currently both conventional and nuclear EPW in the US Nuclear Weapon Enduring Stockpile.<sup>181</sup> According to physicist Robert Nelson, the problem with developing an EPW that is capable of penetrating to significant depths is the strength of the missile casing. If the impact velocity of the warhead is greater than a few kilometres per second, the casing will deform and possibly even melt prior to detonation, thereby limiting the possible effectiveness of such a weapon.<sup>182</sup>

The defeat of chemical and biological agents has been the driving force behind another new type of weapon that could potentially pose some problems in the arms control field. According to Barry Schneider, at least eight *agent defeat* weapons programmes are in progress (as of 2006) that are designed to neutralize enemy chemical and biological assets, including the US Thermobaric and Agent Defeat Weapons programmes.<sup>183</sup> The Defence Threat Reduction Agency and the US Navy have initiated an Agent Defeat Warhead (ADW) demonstration programme to develop a kinetic

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<sup>178</sup> *Report to Congress on the Defeat of Hardened and Deeply Buried Targets*, Submitted by the Secretary of Defense in Conjunction with the Secretary of Energy in response to Section 1044 of the Floyd D. Spence National Defense Authorization Act for the Year 2001, PL 106-398. July 2001, 8.

<sup>179</sup> Ibid.

<sup>180</sup> Ibid.

<sup>181</sup> The B61-11 is able to penetrate up to approximately six metres in dry earth when dropped from a height of 12 200 metres. Mark Bromley, David Grahame and Christine Kucia, “Bunker Busters: Washington’s Drive for New Nuclear Weapons,” *BASIC Research Report*, 2002.2 (July 2002), 43.

<sup>182</sup> Robert W. Nelson, “Low-Yield Earth-Penetrating Nuclear Weapons,” *Journal of the Federation of American Scientists*, Volume 54, Number 1 (January/February 2001): 4.

<sup>183</sup> Barry R. Schneider, “Progress in Counterforce, 1993-2004,” in *Avoiding the Abyss: Progress, Shortfalls, and the Way Ahead in Combating the WMD Threat*, ed. Barry R. Schneider and Jim A. Davis. (Westport: Praeger Security International, 2006), 115-116.



penetrating weapon combined with a low-pressure incendiary warhead.<sup>184</sup> The primary objective of the ADW programme is to develop air-deliverable warhead technologies that could deny an enemy the use of CBW, while causing minimal collateral damage.<sup>185</sup> Other weapons that utilize heat and blast properties could cause unwanted damage in terms of casualties and property. Writing in the *Wall Street Journal*, Thomas Ricks states that, “Its (ADW) mission is to produce the first truly new weapon of the post-Cold War era, a bomb whose effectiveness is to be measured by how many people it doesn’t kill – while it destroys stockpiles of horror weapons.”<sup>186</sup> Currently, the US relies on the use of conventional warheads as the sole means of defeating an enemy’s CB agent capability.

The development of a new weapon such as one that has an agent defeat capability is of significant concern because it could codify expanding mission sets for nuclear weapons. Taken from the US Department of Defense *Quadrennial Defense Review Report* of February 2010:

The proliferation of nuclear, chemical, biological, and radiological capabilities among states and non-state actors can threaten our ability to defend US and allied interests, promote peace and security, ensure regional stability, and protect our citizens. Further, the use of a nuclear weapon or a biological attack would have global ramifications. Preventing the proliferation and use of such weapons is therefore a top national priority for which many federal agencies have important responsibilities. As the ability to create and employ weapons of mass destruction spreads globally, so must our combined efforts to detect, interdict, and contain the effects of these weapons. Deterrence of such threats and defence against them can be enhanced through measures aimed at better understanding potential threats, securing and reducing dangerous materials wherever possible, monitoring and tracking lethal agents and materials and their means of delivery, and where relevant, defeating the agents themselves.<sup>187</sup>

These threats are to be dealt with using a combination of old and new technologies as opposed to the threat of nuclear retaliation, though there will remain a small set of

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<sup>184</sup> Robert W. Nelson, “Nuclear ‘Bunker Busters’ Would More Likely Disperse Than Destroy Buried Stockpiles of Biological and Chemical Agents,” *Science and Global Security*, Volume 12 (2004): 71.

<sup>185</sup> The HTI-J1000, for example, combines high-temperature explosives to ignite and burn chemical agents, with disinfectant chlorine and acids to neutralize biological agents. “Statement of US Navy Capt. Mike Knollmann, Department of Defense Briefing on 2002-Advanced Concept Technology Demonstrations, 5 March 2002.” US Department of Defense, accessed 22 November 2009, <http://www.defenselink.mil/Transcripts/Transcript.aspx?TranscriptID=2880>.

<sup>186</sup> Thomas E. Ricks, “US Military Considers Weapons that Disable Bunkers, Spare People,” *Wall Street Journal*, 1 July 1999, 1.

<sup>187</sup> US Department of Defense, *Quadrennial Defense Review Report*, February 2010, 34.

possibilities in which a nuclear response would be deemed appropriate.<sup>188</sup> Importantly, the United States has pledged to not develop new nuclear warheads. Existing life extension programmes will use only nuclear components based on previously tested designs, and will not support new military missions or provide for new military capabilities.<sup>189</sup> Former Ministry of Defence Permanent Under-Secretary of State Michael Quinlan stated that:

the range of circumstances in which, and of purposes for which, the availability of specialized operational capability of this kind would be crucial for either use or deterrence is too narrow and improbable to warrant incurring the political costs of developing new types of weapon at a time when the international community is looking, especially in the non-proliferation context, for further reduction in the salience of nuclear weapons.<sup>190</sup>

The feasibility of new types of nuclear weapons being developed has decreased with the election of President Barack Obama. His administration was quick to distance itself from the controversial policy decisions of his predecessor. Having said that, President Obama refuses to rule out the possibility of the US deploying nuclear weapons against a hostile state, one that threatens US interests.<sup>191</sup> While funding for new weapon designs is likely to continue, the new administration's desire to develop a novel type of weapon that could have ramifications for current international agreements is less clear.<sup>192</sup> This phenomenon is not exclusive to the US, as other states with foreign policy concerns, such as Russia, could be tempted to embark down this slippery slope.

Another potential challenge is how to prevent states from acquiring nuclear, biological and chemical weapons. For years the Iraqi regime successfully hid parts of its nuclear, biological and chemical weapons programmes from the international community. Even after *Desert Storm* and the acceptance of Security Council Resolution 687, the regime was guilty of trying to deceive UN inspectors that it had given up its proscribed weapons capabilities. Due to the persistence of the Special Commission's Executive Chairman and the diligence of the inspection teams, the tangled web of deception that was created had gradually unraveled. The IAEA however, failed to

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<sup>188</sup> *NPR Report*, 17.

<sup>189</sup> *Ibid.*, 39.

<sup>190</sup> Michael Quinlan, *Thinking About Nuclear Weapons: Principles, Problems, Prospects* (Oxford: Oxford University Press, 2009), 179.

<sup>191</sup> See page 181, note 104.

<sup>192</sup> Refer to US Department of Defense, *Quadrennial Defense Review Report*, February 2010; US Department of Defense, *Nuclear Posture Review Report*, April 2010; US Department of Defense, *Ballistic Missile Defense Review Report*, February 2010.

identify Iraq's clandestine nuclear programme and was ready to sign off on Iraqi compliance, but not before some serious questions were raised and a tense four-day standoff with Iraqi forces in the parking lot of the Nuclear Design Centre after discovering documentation relating to Iraq's nuclear weaponization programme.<sup>193</sup>

The significance of this is that it somewhat mirrors the current situation in the Islamic Republic of Iran. When it became apparent that Iraq was not going to be able to construct a deliverable nuclear device, interest in other types of non-conventional weapons prospered. Iraq's usage of chemical weapons in the 1980s was widespread. Biological weapons were being pursued as well, even though Iraq had signed the BWC in 1972.<sup>194</sup> Iran has signed and ratified the BWC, the CWC as well as the NPT, though it does not necessarily mean that Iran is honoring its treaty obligations. If a non-conventional weapons capability is of a high enough priority, and even if international agreements are in place, some states will do what they can to acquire the technology. As we have seen, the United Kingdom in the immediate postwar period was keenly interested in investigating the utility of biological and new types of chemical weapons when nuclear collaboration with the USA had stopped. This is a crucial point. As evidenced by both the UK and Iraq, two polar type case studies, when the first-choice weapon system is unlikely to be realized, another type of technology is bound to take its place. Britain was ultimately successful in developing a nuclear weapon, and for a period of time BW had received a heightened priority within British defence planning. Iraq was not successful in its nuclear ambitions, but chemical and biological weapons – primarily CW – played an important role in regime politics up to Operation *Desert Storm* and beyond.

## CONCLUSION

The purpose of this chapter has been to identify connections between nuclear weapons on the one hand and biological and chemical on the other, using the UK and Iraq case studies as a basis of comparison. These weapons are intrinsically connected to each other on multiple levels, such as financial constraints, resource allocation or competition, and thoughts on national defence and regional security. Israel sees the retention of a nuclear arsenal – an unofficial, but widely acknowledged arsenal – as key

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<sup>193</sup> See pages 119-120, note 90.

<sup>194</sup> Iraq did not ratify its signature until 1991 as part of United Nations Security Council Resolution 687.

to their significant national defence concerns. France decided to embark upon a nuclear programme in 1954 as a way of reasserting its influence in the international system<sup>195</sup> after a crushing defeat and subsequent five year occupation at the hands of Nazi Germany in the Second World War, coupled with the humiliating loss of French Indochina and the Suez Crisis of 1956.<sup>196</sup> Syrian opinions on chemical weapons have been directly influenced by a nuclear-armed Israel.<sup>197</sup> South Africa's weapons programmes developed out of the growing communist threat in Angola and Mozambique.<sup>198</sup> This was no different in the United Kingdom or Saddam Hussein's Iraq. Both states had their own reasons for pursuing nuclear, biological and chemical weapons.

The findings that came out of the case studies have been organized into four subsections: strategic issues, political considerations, economic factors and future challenges. These four areas proved useful in helping to focus the analysis of interconnections between nuclear weapons on one side and CBW on another. There proved to be more interconnections within the strategic issues section than any other, although it should be said that some of the findings could have slotted into one or more of the sections and these categories should not be seen as being exclusive. A state's strategic concerns play a large part in its decisions to develop NBC weapons. Political and economic factors frequently overlap with strategic concerns and in some instances such as the 1956 decision to discontinue offensive R&D into CBW all three play a part in the government's decision-making process.

Strategic issues proved to be the richest source of examples of interconnections between NW and CBW and my data set incorporated some additional examples to reflect this. Clearly, a state's strategic concerns as well as its strategic culture provide significant motivation for developing NBC weapons. Iraq's principal strategic concerns were Iran and Israel. The development of Iraq's CBW programmes was viewed as necessary to deter a nuclear-armed Israel and a much larger enemy in Iran. Iraq's BW programme was in essence a stopgap measure due to the anticipated long lead-time it

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<sup>195</sup> Interview with John Simpson, 6 August 2008.

<sup>196</sup> As a result of the events in the Suez where the US initially and Britain eventually withdrew support for the action, France became suspicious of having to rely on their allies for support, which would eventually lead them to the decision to withdraw from NATO's military command structure altogether.

<sup>197</sup> "12th Pugwash Workshop on the Middle East: Prospects for a WMD-free Zone, 23 June 2004, Washington." Pugwash Conferences on Science and World Affairs, accessed 4 May 2009, <http://www.pugwash.org/reports/rc/me/ME2004/me06-23-04.htm>.

<sup>198</sup> Helen E. Purkitt and Stephen F. Burgess, *South Africa's Weapons of Mass Destruction* (Bloomington: Indiana University Press, 2005), 52-53.

would take for the regime to acquire a nuclear weapons capability. Once nuclear weapons development became unlikely, biological weapons were promoted as something that could help deter a possible Israeli nuclear strike. This ties in directly to the concept of BW as being the “poor man’s atomic bomb.” Since a nuclear capability is out of the reach of many states, biological and chemical weapons are seen to provide a state with a non-conventional weapon deterrent. Syria, for example, is thought to see chemical weapons as a possible deterrent against Israeli aggression, much the same as Saddam’s regime did. The existence of Israeli nuclear weapons has given cause for the legitimization of CBW in the Middle East.

In the UK, chemical and biological weapons were thought to be able to provide Britain with a deterrent capability in light of the growing Soviet threat in Eastern Europe during the immediate postwar period. Biological weapons in particular were elevated in importance from 1946 until the early 1950s, when it was apparent that Britain was going to successfully detonate its first fission weapon. This in turn led to the 1956 decision to discontinue the offensive chemical weapons programme. Britain was going to rely on its growing stockpile of nuclear weapons as its strategic deterrent. The issue of chemical weapons utility came back into question in the early 1960s due to significant advances in CW – namely the V-agents – as well as the changing strategic environment. The doctrine of flexible response came into prominence at this time as well as Britain’s involvement in limited war engagements in Asia. One of the tenets of flexible response was the prolongation of the non-nuclear phase of combat, in which chemical weapons were believed to be of some value. The thought of British nuclear weapons being deployed against Indonesian forces in the rainforest of North Borneo was not acceptable, which may have been a factor in the 1963 decision to reacquire a limited, retaliatory offensive CW capability. It was not only in the rainforest of Southeast Asia that chemical weapons were thought to be of use. Terrain denial was a key component of NATO’s strategic defence of Europe for decades.

Not strictly bound by the case studies, a few other examples of interconnections came to the fore, two of which involve the former Soviet Union. The 1970s bore witness to a number of bilateral arms negotiations between the US and USSR. The BWC came into being in 1972 a few short months before the two superpowers agreed to the terms of SALT I. The US was keen to complete the BWC negotiations in 1971 once the Soviet Union accepted the principle of a separate ban on BW. This hurried process unfortunately ended up weakening the BWC in favour of a more robust SALT I

agreement. Another interesting example is how the Soviet nuclear arsenal acted as a barrier shield for its considerable biological R&D programme. Having thousands of nuclear warheads provided the biological programme the latitude to invest into BW issues and also mitigated US and western accusations about its prohibited BW activities. Also of note is how security assurances have evolved to include chemical and biological weapons. According to recent US domestic policy, there are a “narrow range of contingencies” in which nuclear weapons can play a role in deterring a potential CBW attack. By doing this it is hoped that states considering acquiring CBW will be deterred from doing so. Former French President Jacques Chirac and former British Secretary of State for Defence Geoff Hoon have echoed this belief.

One of the findings that filtered out of the political side of the case studies was the introduction of specific government legislation by the United States – the Atomic Energy Act – which made it a criminal offense for Americans to share atomic information with other states, including the UK. This piece of legislation had a big impact upon British decision-making at the time and as a result the importance of biological weapons rose considerably. Here you had the withdrawal of cooperation in atomic issues increasing the interest in biological weapons.

The concept of national prestige as a factor for states looking to develop NBC weapons is the other key finding. National prestige has been mentioned as a factor in Britain’s decision to develop a nuclear weapons programme.<sup>199</sup> While it is likely that Britain having an independent nuclear programme exerted modest influence in the decision, what is more significant was Britain’s desire to reestablish the level of collaboration on political and military affairs it enjoyed with the US during the Second World War. Being able to develop a full-scale nuclear programme was a key part in the process of reestablishing the strategic relationship with the US. This was different for Iraq as national prestige exerted a considerable influence on the regime’s decisions to develop NBC weapons.

A small number of key individuals inside the UK defence establishment as well as the Iraqi regime had varying levels of influence within each state’s NBC weapons programmes. In Iraq the key person was Hussein Kamel. As minister of MIC Kamel was directly responsible for the CB programmes as well as overseeing the gas centrifuge enrichment programme. Few, if any, within Iraq would have had a similar

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<sup>199</sup> Peter Hennessy, “How Bevin Saved Britain’s Bomb,” *The Times*, 30 September 1982, 10.

level of influence over the three programmes. Kamel's skills as a programme manager and his position close to Saddam meant that he was a key player within an increasingly insular environment. In the UK it is difficult to see many individuals that were involved in the three weapons programmes in any capacity. As the MoD's Chief Scientific Adviser and first chairman of the DRPC, Sir Henry Tizard was in a position to help influence government policy on NBC weapons, although the DRPC's role in nuclear issues was not extensive. As such, Tizard and the DRPC were strong supporters of CBW as an alternative to nuclear weapons, which was consistent with the overall agenda of the DRPC.

In terms of economics and finances the key findings centered on opportunity costs, key personnel and committees and the competition for resources (men, money and materiel). In the UK, the offensive CBW programmes were casualties of the nuclear weapons programme. While the reasons for cancelling the offensive CBW capability were largely economic, spending money on another strategic deterrent option when the country was still recovering financially from the Second World War was not considered to be sound fiscal policy. Nuclear weapons provided the UK with a strategic deterrent that neither chemical nor biological weapons could have. Even if the costs of the offensive CBW programmes were not high, the economic climate dictated that nuclear weapons, the Royal Navy as well as a downsized conventional army would be enough to guarantee Britain's security and protect its overseas interests.

Trying to develop nuclear, biological and chemical weapons programmes concurrently, places certain conditions upon resources. Trained scientific and technical personnel, money, facilities and equipment are in demand. Iraq had a limited scientific and technical community to draw from, though the regime did not have a problem allocating resources to each of the programmes prior to *Desert Storm*. In postwar Britain, money was not as abundant and as a result certain programmes – both civilian and military – were stressed. However, over £100 million was spent on the nuclear programme between 1946-52 as well as the CBW programmes and the maintenance of the Royal Navy and standing army. Clearly money was not a limitation for the atomic energy project.<sup>200</sup> In the end the allocation of resources, while problematic, did not prove to be the decisive factor in either the UK or Iraq's decisions to develop their

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<sup>200</sup> Gowing and Arnold, *Independence and Deterrence: Volume II*, 45.

respective programmes. As we have seen, the reasons behind the decisions are more complicated and more nuanced than merely the availability of resources.

A few current and future challenges arose out of the analysis. The possibility of developing new types of nuclear weapons to counter the perceived CBW threat had gained some traction during the previous US administration. The existence of hardened and deeply buried targets in the Afghanistan theatre has proven to be difficult for NATO forces to adequately navigate. It is quite possible that there could be a renewed operational utility for new and different types of weapons that would assist in defeating such obstacles. While the development of new agent defeat and lower yield nuclear weapons do not seem to be a priority for the Obama administration, it is not inconceivable to think that this could change depending one's current strategic environment.

The acquisition of nuclear, biological and chemical weapons through either covert purchase or by developing a clandestine programme, presents a considerable international security risk. States looking to develop NBC weapons do so for a variety of external and domestic factors, some of which can be complex in nature. It is unlikely that an all-encompassing explanation for why states seek these types of weapons would be applicable for all cases.<sup>201</sup> By using the United Kingdom and Iraq as case studies, one can see that there are tangible links between NW and CBW that are demonstrable in both democratic and dictatorial states. Since different states make decisions for differing reasons, it is important to try to understand the reasons behind the decisions to acquire nuclear, biological and chemical weapons.

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<sup>201</sup> Gray, *Another Bloody Century*, 160.



## CONCLUSIONS

The farther backward you can look, the farther forward you are likely to see.<sup>1</sup>

- Winston Churchill, 2 March 1944

The purpose of this dissertation has been to understand why states want NBC weapons, and bring to light interconnections between nuclear weapons and CBW. Two historical case studies were used, the United Kingdom and Iraq, which helped to draw out many examples of how decisions to develop nuclear weapons influenced decisions on developing or keeping CBW. How and why states make decisions to develop these weapons are numerous and different states make decisions for different reasons. Having nuclear, biological and chemical weapons for the purpose of use is not always a state's ultimate goal.

For the UK, nuclear weapons provided a strategic deterrent against possible Soviet aggression in Europe. More significantly the British nuclear weapons programme ensured future collaboration between London and Washington in military and political matters. This ranged from R&D into new types of delivery systems as well as a coordinated targeting system in the event of nuclear war with the Soviet Union. And when nuclear collaboration was not possible due to certain pieces of US domestic legislation other types of weapons technology, most notably biological, rose to the forefront. Even though little was known regarding the uncertainties of biological warfare agents, and the probabilities of failure were high, it was hoped that a strategic biological weapon would be in service by 1957 with the understanding that it would be comparable in strategic effect with the atomic bomb. This never materialized and biological weapons were soon to drift out of prominence. Chemical weapons provided Britain with a defensive capability during the Second World War. There was a real fear that there would be an attempt at an amphibious German invasion of the south England coast. As a result, plans were drawn up by the Air Ministry to contaminate possible landing sites with mustard. Nuclear weapons are seen to be the ultimate in military engineering and technology. They are technologically sophisticated and catastrophically dangerous, which makes them all the more appealing to states looking for a strong

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<sup>1</sup> A Tribute to Physicians – A speech in proposing the toast of “The College” at the luncheon of the Royal College of Physicians in London, 2 March 1944. Reprinted in Charles Eade, *The Dawn of Liberation: War Speeches by the Right Hon. Winston S. Churchill, OM, CH, MP, 1944* (London: Cassel, 1945), 24.

deterrent capability or wanting something more. For Britain in the 1950s, nuclear weapons were a means to an end and the end has not always been about dropping bombs on the USSR, but as a major deterrent to war.<sup>2</sup> Its objective was the reestablishment of US-UK military and political collaboration at the highest levels of power.

Iraq during the 1980s had tried to actualize all three programmes simultaneously. Substantial amounts of money and resources were needed to start its nuclear weapons programme. With the loss of the Osirak research reactor, it became increasingly unlikely that Iraq would be able to reconstitute its plutonium-based civil nuclear power programme. Saddam Hussein had placed high priority on being able to develop a nuclear weapon. Only one of Iraq's two primary regional rivals – Israel – possessed nuclear weapons. Iran did not, though currently there are concerns over its alleged civil nuclear energy programme. Very few states have been able to develop a deliverable nuclear weapon and this was always going to be a difficult enterprise for the Iraqi scientific community. Chemical weapons were used extensively by the regime for the better part of a decade, starting with the Iran-Iraq War. Many threats were issued outlining plans to use non-conventional weapons against Israel as well as coalition forces prior to *Desert Storm* in 1991. While it remains to be seen whether or not one can effectively deter a potential nuclear weapons attack with the threat of chemical or biological weapons, the simple fact is that Saddam believed in the utility of these weapons and was committed to the further R&D of the proscribed programmes in the aftermath of *Desert Storm* and in the face of UNSCOM inspections.

For Saddam, simply having a large standing army and ballistic missile capability was not enough. There was a certain attraction that NBC weapons held. As Kanan Makiya explains:

The meaning of mere possession of weapons of mass destruction – as distinguished from normal armaments designed for combat that has goals and a military strategy associated with it – originates in the firm intentionality to use them in whatever ultimate situation; hence, possession alone of weapons expressly designed for the wholesale slaughter of noncombatants is a perfectly adequate indication of criminal intent on the part of any government irrespective of its politics.<sup>3</sup>

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<sup>2</sup> John R. Walker, *British Nuclear Weapons and the Test Ban: 1954-1973* (Farnham: Ashgate, 2010), 11.

<sup>3</sup> Kanan Makiya, *Republic of Fear: The Politics of Modern Iraq* (Berkeley: University of California Press, 1989), 287.

Prestige and regional security concerns were the cornerstones of the regime's interest in non-conventional weapons technology. Saddam was of the belief – as were many other senior regime officials – that chemical weapons saved Iraq during the war with Iran as well as preventing Israel from launching air strikes in the build up to *Desert Storm*. Once nuclear weapons were off the table, biological and chemical weapons would fill the perceived void in Iraqi strategic defence planning. The most significant thing that the Iraq case shows us is that chemical and biological weapons are seen to be of use when nuclear weapons are not an option. Substantial resources were put into Iraq's proscribed CBW programmes during the 1980s and they continued to pose a significant security risk decades later.

The paths to NBC weapons acquisition can be technically difficult and financially taxing for even the most technologically advanced states.<sup>4</sup> The problems multiply for less technologically advanced states with smaller scientific communities and also where resources (raw materials, infrastructure, money) are less available. This impinged upon the regime's abilities to develop a full NBC weapons capability. Britain largely did not have such concerns insofar as the scientific expertise in British laboratories and universities was of a high calibre. The numbers of individuals that were needed did pose somewhat of a problem as private sector firms ended up competing with the civil service for the best candidates. This however did not impact upon Britain's abilities to research and develop a nuclear, biological and chemical weapons capability.<sup>5</sup>

### *Points of Note*

A number of key points have arisen from this dissertation relating to how NW and CBW can influence each other, inspired from evidence gathered in the case studies. First is how nuclear disarmament could reduce the possibility of CBW proliferation. Some states see NBC weapons as a component necessary for strategic defence, especially in light of a similarly armed adversary. In the postwar period the Soviet Union was suspected of involvement in NBC R&D, suspicions that were confirmed with the detonation of their first nuclear weapon in 1949, years before the West thought possible. Britain at the time had embarked down the path of trying to develop a nuclear programme in spite of the discontinuation of collaboration with the US in atomic issues.

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<sup>4</sup> See Appendix 8: Technical Routes to NBC Acquisition.

<sup>5</sup> Refer to Chapter Three for a more detailed analysis.

At the same time Britain was investigating the utility of biological weapons as an alternative to nuclear weapons, as creating a full-scale nuclear programme had a long lead-time and required significant investment of resources. Shortly after the end of the Second World War the Soviet Union had replaced Nazi Germany as the predominant military threat to the West. The threat of Soviet aggression was very prevalent within the UK, especially after the 1949 Soviet nuclear test that Britain felt it needed to possess a strategic weapon capable of deterring Soviet aggression. In the aftermath of the 1946 Atomic Energy Agreement, it was thought that biological weapons could fill this void. It is quite possible that Britain may not have felt the need to develop a non-conventional strategic capability, if the Soviets had not either. If no one possessed nuclear weapons, then it is possible that the potential for CBW proliferation would be greatly diminished.

The flip side of this is how nuclear disarmament could promote CBW proliferation. If a particular state believes that possessing a non-conventional armament is crucial to its defence and security, then there is the possibility that it will attempt to acquire a capability. Nuclear weapons are thought to be the most desired out of the three types of weapons. If it is not possible for a state to possess nuclear weapons then it is very likely that it could turn to chemical or biological weapons to fulfill its strategic needs, as was the case in Iraq. This leads directly into the concept of CBW being “the poor man’s atomic bomb.” This idea gained traction through the belief that you could use CBW to deter nuclear weapons. Iraq, Syria, Egypt, all of these states has at one time thought this – chemical and biological weapons can provide a deterrent capability against a nuclear-armed state. Whether this is actually the case remains to be seen. What is a real concern is that some states see CBW as being able to provide a level of deterrence against an enemy that possesses nuclear weapons. The key here is if it was not possible for a state to develop or acquire nuclear weapons, then the alternative could mean a CBW capability. States desire these types of weapons for a multitude of reasons and it is conceivable that if nuclear weapons were off the table, then CBW becomes much more attractive. As we have seen, this was the case in both the United Kingdom and Iraq.

Further to this point, can successful nuclear anti-proliferation create possible incentives for CBW armament? This is key. Iraq was not able to develop a full-scale nuclear programme but it was much more successful in chemical and biological warfare development. This was much the same as in the UK some forty years earlier when the Atomic Energy Act prevented nuclear collaboration with other states, which in turn

helped to elevate the importance of biological weapons within British strategic planning, albeit for a relatively short period. Preventing more states from acquiring nuclear weapons might lead them to try and acquire other types of non-conventional weapons. This is not to suggest that any state should have the *right* to develop nuclear weapons. It is meant to show that chemical and biological weapons could be attractive alternatives if nuclear weapons development is not possible. Brad Roberts states:

What is required is a larger antiproliferation strategy encompassing a comprehensive set of political, economic, military, and diplomatic policies aimed not just at halting the spread of weapons but at coping with the consequences of their proliferation, shaping the will to acquire as much as the means to acquire, and working toward deproliferation where it is a serious prospect.<sup>6</sup>

Based on evidence from the case studies, we see how nuclear weapons can justify the existence of CBW. One needs to look no further than the general response in the Middle East, most notably from Syria and Iraq, towards Israel's suspected nuclear arsenal. Israel's nuclear weapons helped foster the justification of CBW armament in the region. Unable to acquire nuclear weapons from themselves, Iraq believed that CBW could act as a deterrent against an Israeli nuclear attack. What is significant about this is that it is likely that Iran views non-conventional armament in much the same way. There are a lot of questions surrounding Iran's alleged civil nuclear energy programme and the fear is that Iran is interested in acquiring nuclear weapons – something that Iraq was not able to do.

On the other hand, knowing that states will try to acquire whatever weapons capability they can helps justify the retention and possibly the proliferation of nuclear weapons. Despite calls for Israel to come clean regarding their alleged nuclear weapons programme, one must think that it would be reluctant to renounce its programme in light of past and present regional threats. This creates a real proliferation problem in the Middle East. Some Arabic states claim that they see CBW as providing a deterrent against Israel's nuclear weapons. One must ask the question of whether any of these states would give up its desire to acquire CBW if Israel had begun the process of nuclear disarmament? Even so, it remains unlikely that Israel would entertain the notion of nuclear disarmament.

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<sup>6</sup> Brad Roberts, "From Nonproliferation to Antiproliferation," *International Security*, Volume 18, Number 1 (Summer 1993): 163.

Another key point is how the possession of nuclear weapons may facilitate the acquisition of CBW. For some, nuclear weapons are seen to be the pinnacle of military technology and engineering, and the retention of other non-conventional weapons capabilities is superfluous. The belief here is that if it is a strategic deterrent that is desired then nothing is more effective than a modern nuclear arsenal. However, different states have differing criteria for wanting to possess non-conventional weapons. States desire these types of weapons for many reasons and it is not to say that once a state has nuclear weapons it will not be interested in chemical or biological weapons. Possession of nuclear weapons does not necessarily denote a lack of interest in other types of non-conventional weapons. These weapons are terror weapons and can be used to subdue a specific population, similar to Iraq's subjugation of its Kurds. These weapons have a different utility to nuclear weapons and if a state possesses NW, there would be little stopping them from trying to develop chemical or biological weapons. This depends entirely on a state's strategic culture and its outlook on non-conventional weapons. Understanding the nuances of an adversary's strategic culture can be beneficial to understanding its decisions to develop nuclear, biological or chemical weapons.

The existence of chemical and biological weapons can promote interest in developing new types of conventional and nuclear technology designed to defeat CBW agents and weapons. Interest in the US Navy's Agent Defeat Warhead as well as the debate on the efficacy of nuclear earth penetrating weapons continues, though it has lessened somewhat over the past few years due in part over US Congress' refusal to approve expenditure on R&D into 'bunker buster' technology.<sup>7</sup> And according to the 2010 *Nuclear Posture Review Report*, the United States has pledged to not develop new nuclear warheads, citing that they will use only nuclear components based on previously tested designs, and will not support new military missions or provide for new military capabilities.<sup>8</sup>

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<sup>7</sup> Michael Quinlan, *Thinking About Nuclear Weapons: Principles, Problems, Prospects* (Oxford: Oxford University Press, 2009), 179.

<sup>8</sup> US Department of Defense, *Nuclear Posture Review Report*, April 2010, 39. This is a considerable change from the Bush administration's opinions on weapons technology, when in 2006 the *National Military Strategy to Combat Weapons of Mass Destruction* report stated that, "our intent and actions should deter a potential adversary from considering the initial or subsequent use of WMD. Adversaries must believe they will suffer severe consequences and that their objectives will be denied if they threaten or resort to the use of WMD. Deterrence of WMD in the current era requires that US Armed Forces possess a broad set of military capabilities to prevent an adversary from attacking with WMD and to protect against attacks." Report by the Chairman of the Joint Chiefs of Staff, *National Military Strategy to Combat Weapons of Mass Destruction*, (Washington, 13 February 2006), 17.

While it is unlikely that there will be a reversal of current policy, it is not to say that it cannot happen. The decision taken in 1956 to discontinue the offensive chemical weapons programme was due primarily to economic pressures. Fast-forward to May 1963 and a new British government took the decision to reacquire a limited offensive chemical weapons capability, including both lethal and incapacitating agents. This was due to recent advances in chemical weapons development as well as the changing international strategic environment. This was when flexible response began to replace massive retaliation as the predominant strategic doctrine of the UK. One of the key points in flexible response was the expansion of the non-nuclear phase of combat. Chemical weapons were thought to be able to provide Britain a tactical war fighting capability in either a limited war engagement or in a global war against the Soviet Union. This shows that weapons policy can be created or reversed depending on the weapon's utility and the current strategic climate. States will want to know that they are adequately prepared and equipped to deal with a whole range of conventional and asymmetric threats. This may include creating policies for NBC weapons development if the current climate dictates.

#### *Areas for Future Research*

Economic considerations were left largely unresolved by the case studies. It is not clear as to the overall impact the British and Iraqi economic states played in their respective abilities to develop NBC weapons programmes. A more erudite study on the economics of each state would be required and was well outside the boundaries of this research project. It would be especially interesting to see a comprehensive resource allocation for Iraq's NBC programmes. However, this may be difficult given the regime's proclivity for overly bureaucratic administrative processes in terms of regime finance, as well as its illicit procurement activities.

During the data collection phase of this project, the research led to some significant findings/connections that centre on the Cold War relationship between the US and USSR. It was during this period that the two countries entered into a number of important bilateral arms control agreements including the 1963 Atmospheric Test Ban (ATB) and continuing with the 1968 Nuclear Nonproliferation Treaty and up to the Strategic Arms Limitation Treaty and Biological Weapons Convention in 1972, which

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was designed, as David Hoffman argues, to “make the Cold War manageable and less threatening.”<sup>9</sup> The creation of the BWC did little to prevent the Soviets from expanding their military BW programme and violating their treaty obligations in the process. The US in fact, had accused the Soviets of violating treaty obligations as early as 1980 in light of the 1979 outbreak of anthrax in Sverdlovsk and had started to demand verification of Soviet activities. There could be any number of reasons as to why the Soviets were interested in possessing such a comprehensive BW capability. There was a strong element of distrust of the US repudiation of offensive biological weapons production that convinced them that they could not trust that the US was serious in their efforts at disarming and that it must have been a ploy to get the Soviets to disarm. Interestingly, the existence of the immense Cold War Soviet nuclear arsenal gave their military-industrial complex the latitude to sink large amounts of capital into their clandestine BW programme. Nuclear weapons provided the USSR with a strong and credible strategic deterrent, strong enough to prevent serious accusations about their clandestine activities from being pursued by the accusers.<sup>10</sup> This is significant as it highlights an example of how the possession of nuclear weapons can contribute to the escalation of R&D into other types of non-conventional weapons. Situations such as this make it difficult to appreciate why a state takes a particular decision to try and acquire a nuclear, biological or chemical weapons capability, which is all the more reason that states need to have a better understanding of their opponent’s strategic culture.<sup>11</sup>

The example of the Soviet Union’s nuclear weapons programme providing the BW programme latitude to invest in R&D is another potential area of future research. It would be necessary to have a greater understanding of Soviet/Russian strategic culture as well as their views on NBC weapons, which is likely different from the UK or US. A better understanding of why the Soviets placed such an emphasis on BW when they possessed thousands of nuclear warheads is somewhat of a mystery. This could in turn provide further insight into why states decide to acquire or develop nuclear, biological and chemical weapons.

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<sup>9</sup> David E. Hoffman, *The Dead Hand: The Untold Story of the Cold War Arms Race and its Dangerous Legacy* (New York: Doubleday, 2009), 20.

<sup>10</sup> Interview with Brian Jones, 4 December 2008.

<sup>11</sup> For analyses of the Soviet BW programmes, see, Ken Alibek with Stephen Handelman, *Biohazard: The Chilling True Story of the Largest Covert Biological Weapons Program in the World – Told from the Inside by the Man Who Ran It* (New York: Delta, 1999); Igor V. Domaradskij with Wendy Orent, *Biowarrior: Inside the Soviet/Russian Biological War Machine* (Amherst: Prometheus Books, 2003); David E. Hoffman, *The Dead Hand: The Untold Story of the Cold War Arms Race and its Dangerous Legacy* (New York: Doubleday, 2009).



Another issue that presents a significant challenge to the problem of state-level acquisition of nuclear, biological and chemical weapons concerns dual-use technology. This presents a problem on multiple levels. As we saw with Iraq in the 1980s, there was a covert nuclear weapons programme, which was concealed by the legitimate, state-run civil nuclear energy programme. Not that having a nuclear energy programme is a necessary precursor to developing a nuclear weapons programme, but clandestine activities inside Iraq were well hidden from the IAEA under the premise that their nuclear-related activities were necessary for the maintenance of their energy programme. Currently this situation is mirrored in events occurring in Iran, where its government is claiming its right to develop a peaceful, civil nuclear energy programme. Iran has long been suspected of violating its treaty obligations under the NPT and as a result international sanctions have been implemented at various points. While it cannot be said for sure that Iran is trying to enrich uranium to the 90% level needed for nuclear weapons development, it is clear that its intent is considerably less noble than what is stated. Concealing a clandestine nuclear weapons programme is considerably more difficult than hiding a CBW programme due to the resources and facilities required. In light of this, a potential research project could focus on a comparative analysis between nuclear and CBW dual-use proliferation problems.

Since its introduction there has been a distinct lack of empirical studies that have attempted to test the bureaucratic politics model. A few of the studies have ended up focusing on individual crises as opposed to routine policy decisions. Deciding to develop a nuclear, biological or chemical weapons programme is hardly routine, but many decisions are not taken during any sort of crisis. It would be interesting to apply the bureaucratic politics model to a specific set of decisions on NBC weapons technology, that were made in the United Kingdom. A brief glimpse in to the decision to develop an atomic weapons programme was highlighted in the UK case study. The initial findings would suggest that bureaucratic politics could provide a different level of analysis on British decision-making and NBC weapons policy. A more thorough examination of British decisions and the bureaucratic politics model would be interesting.

### *Summary*

Preventing states from acquiring nuclear, biological and chemical armaments presents a substantial challenge for the democratic states of the West. Brad Roberts writes that, “Since the advent of the nuclear era in 1945, Americans and others have been debating whether or how it might be possible to prevent the proliferation of nuclear and other weapons of mass destruction.”<sup>12</sup> The threat of retaliation and economic sanctions are two things that can help prevent this from happening. The creation of broad-based international treaties and regimes are yet another tool to help deter states from trying to develop NBC weapons programmes. Unfortunately, states like Iraq and North Korea have demonstrated how simple a matter it is to hide an illicit weapons programme under the cover of a legitimate, and internationally inspected, civil programme. Nevertheless there is a need to ensure that appropriate resources are dedicated to the nonproliferation of chemical and biological weapons as well as nuclear weapons.

This dissertation set out to demonstrate the interconnections between nuclear weapons and chemical/biological weapons. There are some tangible linkages between the two ranging from strategic deterrence concerns to increased competition for resources as illustrated by the UK and Iraq case studies. Nuclear weapons and CBW are intrinsically linked to each other because they can rationalize the other’s existence. If nuclear weapons are not available to a state then it is possible that CBW will be pursued and if a state has acquired NW it does not necessarily mean that it will rule out pursuing a CBW capability. Reasons why states want these types of weapons are numerous and sometimes complicated. Disarmament and anti-proliferation measures, while respectable, can often create other issues that are more difficult to navigate. Unfortunately it is not as simple as banning nuclear weapons or CBW. This is a complex set of problems and one that is unlikely to subside in the near future. What this all means is that while nuclear proliferation remains at the apex of international interest and concern, CBW proliferation should be neither ignored nor discounted.

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<sup>12</sup> Brad Roberts, “Nonproliferation – Challenges Old and New,” in *Avoiding the Abyss: Progress, Shortfalls, and the Way Ahead in Combating the WMD Threat*, ed. Barry R. Schneider and Jim A. Davis. (Westport: Praeger Security International, 2006), 75.

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APPENDIX 1

A TYPOLOGY OF POLICYMAKING

		DECISIONMAKERS ARE			
		PERFECTLY RATIONAL		IMPERFECTLY RATIONAL	
SINGLE DECISIONMAKER		Complete Information	Incomplete Information	Complete Information	Incomplete Information
		Complete Information	Incomplete Information	Complete Information	Incomplete Information
		Complete Information	Incomplete Information	Complete Information	Incomplete Information

Source: Jonathan Bendor and Thomas H. Hammond, "Rethinking Allison's Models," *The American Political Science Review*, Volume 86, Number 2 (June 1992), 303.



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WO 208/2174 – Field technical assessment by Porton group, 1944-1945

WO 286/73 – Review of research policy on chemical and biological warfare, 1955-1963

WO 286/77 – Chemical warfare policy; including the future of Nancekuke, 1953-57

### **APPENDIX 3: LIST OF INTERVIEW PARTICIPANTS**

Arnold, Lorna. Former Official Historian, British Nuclear Weapons Programme, 12 October 2008.

Balmer, Brian. Reader, Science Policy Studies, University College London, 4 August 2008.

Barton, Rod. Former UNSCOM Inspector, 4 April 2008.

Baute, Jacques. Director of the IAEA Iraq Nuclear Verification Office, 25 April 2008.

Black, Steve. Former UNSCOM Inspector, 8 April 2008.

Buchanan, Ewen. Information Officer, United Nations Office of Disarmament Affairs (UNODA), 31 March 2008.

Carter, Gradon B. Former Historian, Defence Science and Technology Laboratory, Porton Down, 27 November 2008.

Carus, W. Seth. Deputy Director of the Center for Counterproliferation Research, National Defense University, 3 April 2008.

Duelfer, Charles. Former Special Representative to the Director of Central Intelligence, 10 April 2008.

Gallucci, Robert L. Former Deputy Executive Chairman, UNSCOM, 9 April 2008.

Godfrey, Rod. Former UNSCOM Inspector, 7 May 2008.

Goodman, Michael S. Senior Lecturer, War Studies Department, Kings College London, 1 December 2008.

Hillerman, Jan. Fellow, Division of Concepts and Planning (SGCP), IAEA Department of Safeguards, 19 August 2008.

Jones, Brian. Ex-Defence Intelligence Staff, Ministry of Defence, 4 December 2008.

Manley, Ronald G. Former Director, Verification Division, OPCW, 28 April 2008 & 29 August 2008.

Roberts, Brad. Fellow, Institute for Defence Analyses, 7 April 2008.

Senior UNSCOM Official, 31 March 2008.

Simpson, John. Director, Mountbatten Centre for International Studies, University of Southampton, 6 August 2008.

Smithson, Amy E. Senior Fellow, James Martin Center for Nonproliferation Studies, 4 April 2008.

Spector, Leonard S. Deputy Director, James Martin Center for Nonproliferation Studies, 7 April 2008.

Spertzel, Richard O. Former Senior Biologist, UNSCOM, 5 April 2008.

Stoddart, Kristan. Research Fellow, Mountbatten Centre for International Studies, University of Southampton, 6 August 2008.

Trevan, Tim. Former Senior Advisor, UNSCOM, 5 April 2008.

Tucker, Jonathan B. Senior Fellow, James Martin Center for Nonproliferation Studies, 4 April 2008.

Utkina, Svetlana. Programme Manager, United Nations Office of Disarmament Affairs (UNODA), 31 March 2008.

Walker, John. Arms Control and Disarmament Research Unit (ACDRU), Foreign and Commonwealth Office, 24 April 2008 & 4 August 2008.



## APPENDIX 4: INTERVIEW CONSENT FORM

**Name of Researcher, Faculty, Programme, Contact Information:**

Robert D. Lovsin, The Harvard Sussex Program, +44-1444-414-342, r.d.lovsin@sussex.ac.uk

**Supervisory Team:** Julian Perry Robinson, The Harvard Sussex Program  
Daniel Feakes, The Harvard Sussex Program

**Title of Project:** Nuclear, Biological and Chemical Weapons Policy: A Comparative Analysis

**Purpose:**

You will be asked to participate in an interview process with questions relating to nuclear, biological and chemical weapons programs in the UK/Iraq. The interview process will take between 45 and 60 minutes. It consists of the subject responding to verbal questions posed by the interviewer. There will be no questionnaires or other documents included.

Your participation in this process is entirely voluntary. You have the right to refuse to participate in parts of the study or to withdraw from the study at any time without cause for concern. If you should decide to withdraw at any time from the study, you will have the opportunity to choose whether or not to have the data provided included in the final analysis of the research project.

**Personal Information:**

The only personal information that will be collected in this study will be names, first and last, location of employment and title. However, if so desired it will be possible for the subject to remain completely anonymous.

There are a few options for you to consider if you decide to take part in this research. You can choose all, some or none of them. Please put a mark on the corresponding line(s) that grants me permission to:

*I grant permission to be audio taped:* Yes: \_\_\_\_ No: \_\_\_\_

*I grant permission to have my business/institute's name used:* Yes: \_\_\_\_ No: \_\_\_\_

*I wish to remain anonymous:* Yes: \_\_\_\_ No: \_\_\_\_

**Consent:**

Your signature on this form indicates that you, 1) *understand to your satisfaction the information provided to you about your participation in this research project, and 2) agree to participate as a research subject*. In no way does this waive your legal rights nor release the investigators, sponsors, or involved institutions from their legal and professional responsibilities. You should feel free to ask for clarification or new information throughout your participation.

Participant's Name/Signature: \_\_\_\_\_

Researcher's Name/Signature: \_\_\_\_\_

Date: \_\_\_\_\_

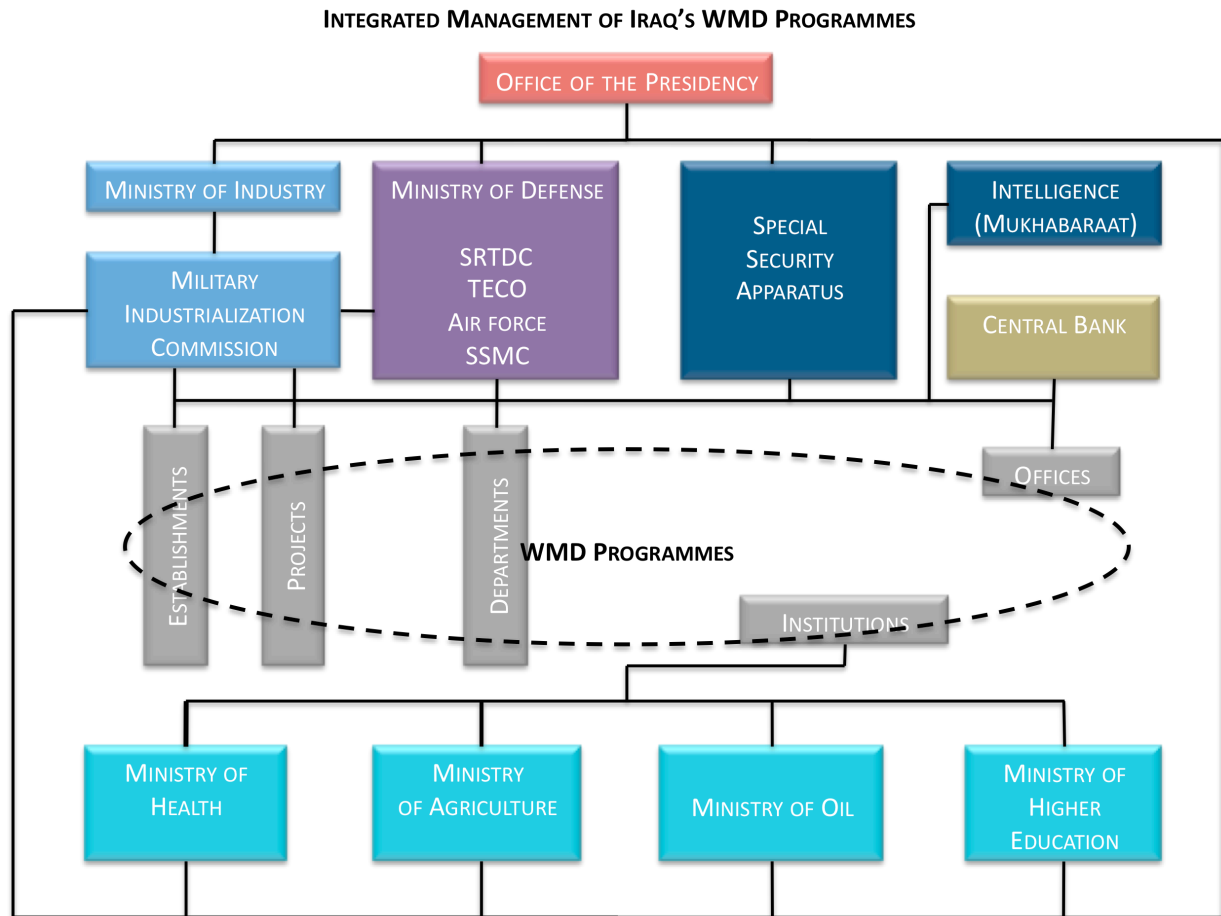
**APPENDIX 5: BRITISH NUCLEAR TESTS, 1952-58**

<b>Test Series</b>	<b>Test Name</b>	<b>Location</b>	<b>Date</b>	<b>Yield</b>	<b>Explosion Conditions</b>
	Hurricane	Monte Bello (off Trimouille Island)	3/10/52	25 kt	Ocean surface burst (HMS <i>Plym</i> )
Totem	Test 1	Emu Field	15/10/53	10 kt	Tower
Totem	Test 2	Emu Field	27/10/53	8 kt	Tower
Mosaic	G1	Monte Bello (off Trimouille Island)	16/05/56	15 kt	Tower
Mosaic	G2	Monte Bello (off Alpha Island)	19/06/56	60 kt	Tower
Buffalo	One Tree, Round 1	Maralinga (One Tree)	27/09/56	15 kt	Tower
Buffalo	Marcoo, Round 2	Maralinga (Marcoo)	4/10/56	1.5 kt	Ground
Buffalo	Kite, Round 3	Maralinga (Kite)	11/10/56	3 kt	Airburst over land
Buffalo	Breakaway, Round 4	Maralinga (Breakaway)	22/10/56	10 kt	Tower
Grapple	Grapple 1/Short Granite	Malden Island	15/05/57	200-300 kt	Airburst over ocean
Grapple	Grapple 2/Orange Herald	Malden Island	31/05/57	720 kt	Airburst over ocean
Grapple	Grapple 3/Purple Granite	Malden Island	19/06/57	150 kt	Airburst over ocean
Antler	Round 1	Maralinga (Tadje)	14/09/57	1 kt	Tower
Antler	Round 2	Maralinga (Biak)	25/09/57	6 kt	Tower
Antler	Round 3	Maralinga (Taranaki)	9/10/57	25 kt	Balloon-burst over land
Grapple X	Round A	Christmas Island (southern tip)	8/11/57	1.8 Mt	Airburst over ocean
Grapple Y	Grapple Y	Christmas Island (southern tip)	28/04/58	2 Mt	Airburst over ocean
Grapple Z	Pendant 2	Christmas Island (southern tip)	22/08/58	24 kt	Balloon-burst over land
Grapple Z	Flagpole 1	Christmas Island (southern tip)	2/09/58	1.21 Mt	Airburst over ocean
Grapple Z	Halliard 1	Christmas Island (southern tip)	11/09/58	0.8 Mt	Airburst over ocean
Grapple Z	Burgee 2	Christmas Island (southern tip)	23/09/58	25 kt	Balloon-burst over land

Source: Britain's Nuclear Weapons – British Nuclear Testing

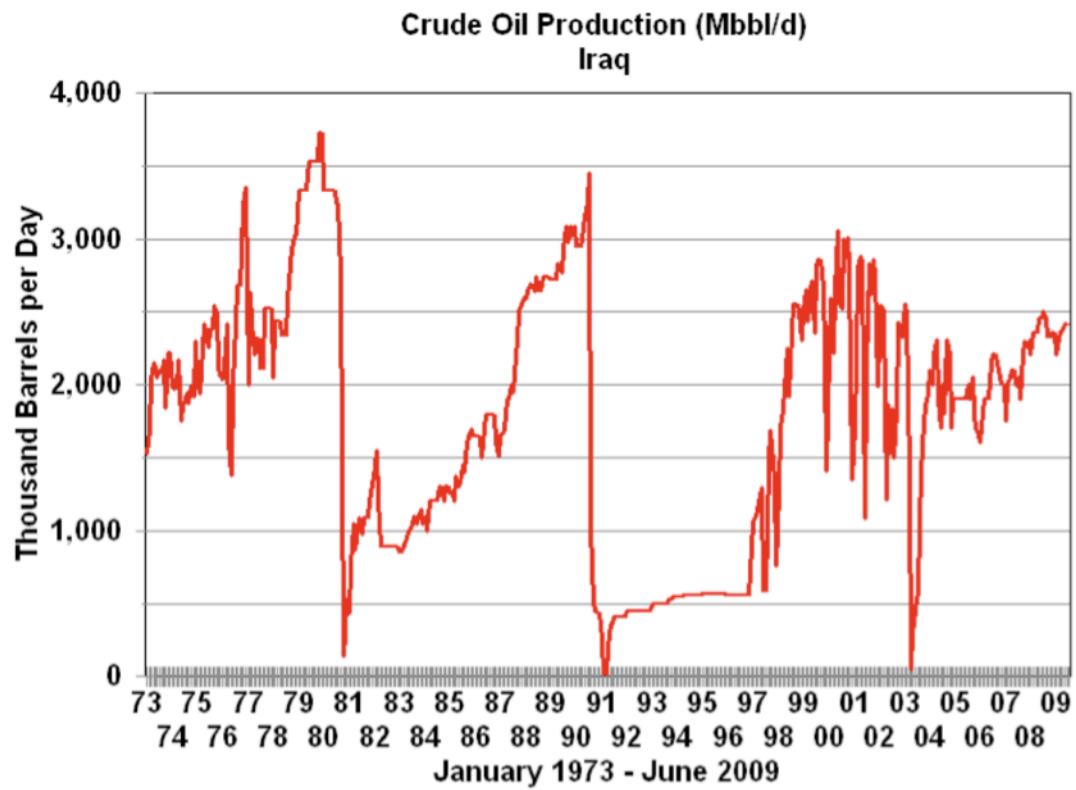
<http://nuclearweaponarchive.org/Uk/UKTesting.html> (accessed 29 November 2009); Lorna Arnold, *Britain and the H-Bomb* (Basingstoke: Palgrave, 2001) 176-191.

## APPENDIX 6



Source: United Nations Monitoring, Verification and Inspection Commission (UNMOVIC) Compendium of Iraq's Proscribed Weapons Programmes in the Chemical, Biological and Missile areas, June 2007, Chapter 7, 1045.

## APPENDIX 7



Source: WTRG Economics, Oil Price History and Analysis, <http://www.wtrg.com/prices.htm>

## APPENDIX 8: TECHNICAL ROUTES TO NBC WEAPONS CAPABILITY

Figure 5.1 Technical Routes to a Nuclear Weapons Capability

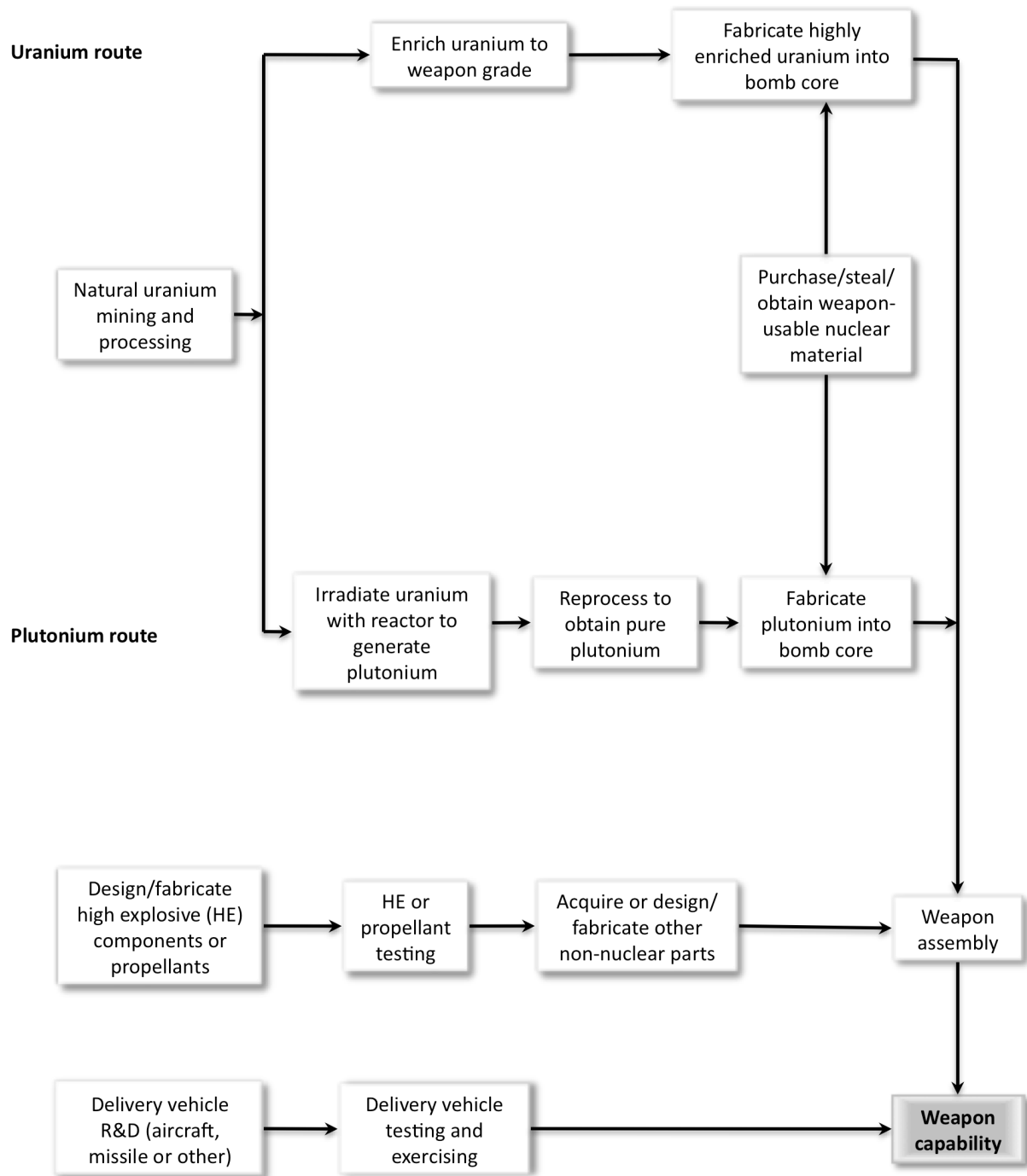


Figure 5.2 Biological Weapon Acquisition

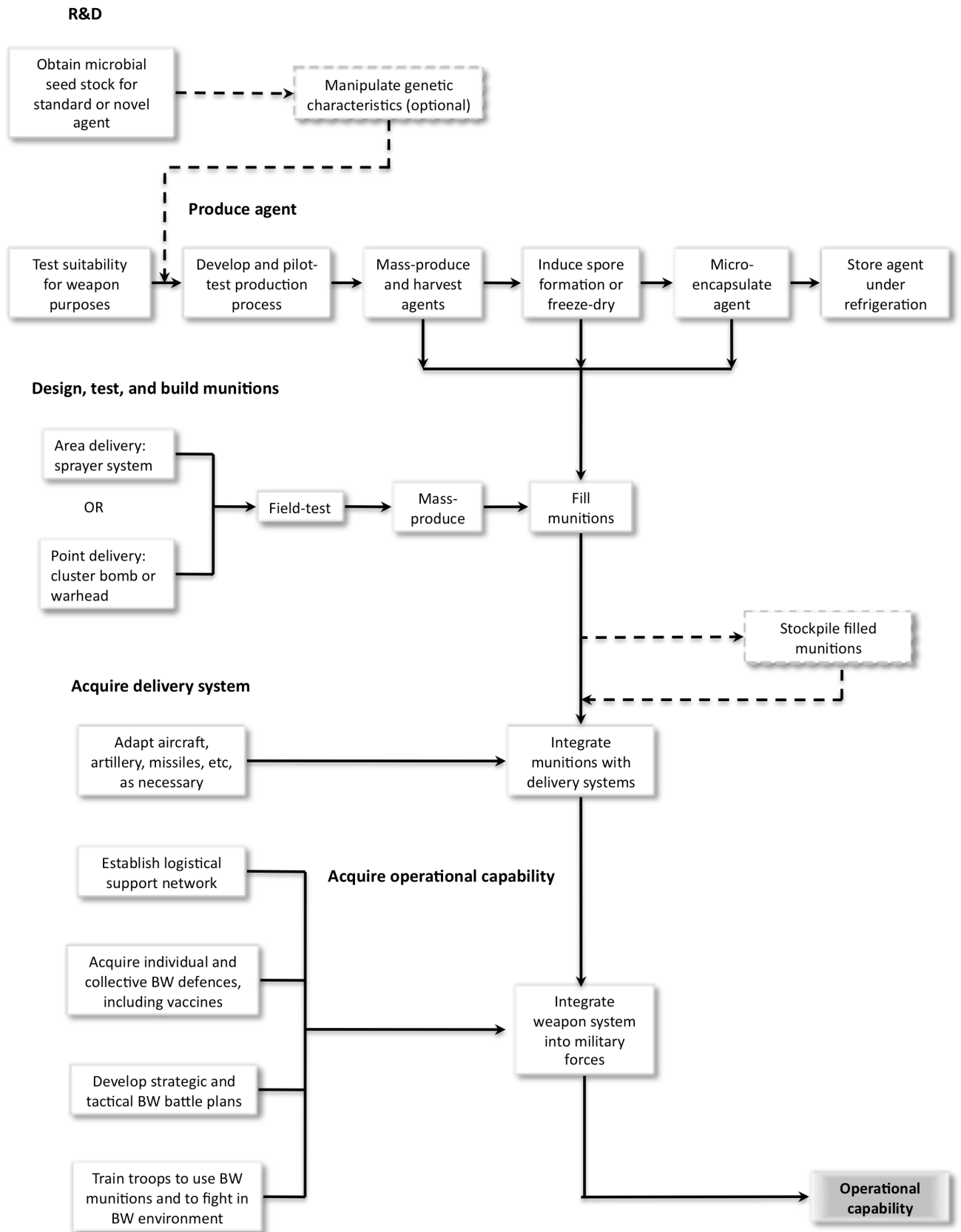


Figure 5.3 Chemical Weapon Acquisition

